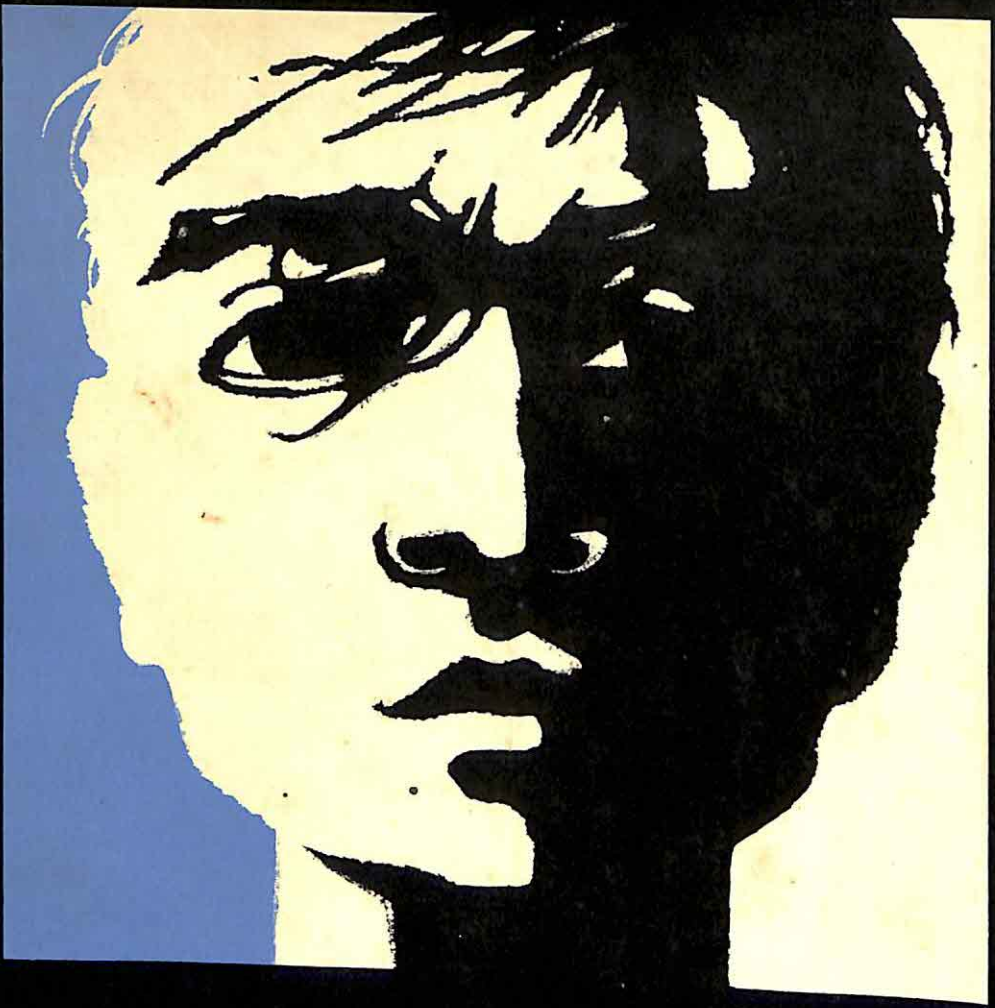

LANGUAGE and MENTAL RETARDATION

Richard L. Schiefelbusch

Ross H. Copeland

EMPIRICAL and CONCEPTUAL CONSIDERATIONS

James O. Smith

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EDITED BY *Richard L. Schiefelbusch*
Ross H. Copeland
James O. Smith
THE UNIVERSITY OF KANSAS

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PREFACE

This book on language and mental retardation treats two exciting and related fields of study. Language as a field is drawing increasing attention from psychology, education, anthropology, speech pathology and audiology, physiology, neurology, and communication sciences, to name a few. Likewise, mental retardation as a primary social and economic problem is receiving special attention from legislators, community planners, social scientists, medical specialists, and many others. One dimension of special interest to many people from these fields of work is the *interrelation* of language and retardation.

There is general agreement that the two primary distinguishing features of mental retardation are subnormal intellectual functioning and inappropriate (maladaptive) social behavior. Language functions seem to be closely associated with each feature. That is, intelligence and language seem to be similarly influenced by the same antecedent factors and are evaluated by largely the same test items. Similarly, adaptive behavior is governed largely by the same factors that have established communication behavior. There are apparently many functions that are common to both sets of behaviors.

In this brief analysis we mean to establish language functions as basic features of the generalized social problem that we have designated as mental retardation. We also wish to point out that, in turn, mental retardation is a promising area in which to investigate many of the critical functions of language. Hopefully, these issues will emerge in sharper focus from the contents of this book.

The plan of the book includes two overview chapters and, successively, chapters on psycholinguistics, referential processes for speakers and listeners, applications of basic laboratory research, language development, neurological approaches, evaluation procedures, and three chapters on training and training arrangements. The last chapter presents suggestions or guidelines for further work. It is the résumé of planning discussions involving twelve discussants, which will be especially stimulating to those who seek new directions for language evaluation and training. In sum, the book provides a balance between theory and basic research information on the one hand and practical information for clinical work and clinical research application on the other.

The book is based on a series of papers presented by the authors at a conference held at Lawrence, Kansas, December 1963 (made possible by the support of USOE Project F-010). Several of the papers received little alteration. Others reflect careful rewriting, which has both strengthened and updated the content. In both cases we commend the papers to you as a contribution to the understanding of language and mental retardation.

Because the conference focused on theories, models, and strategies of language and on their application to the field of mental retardation, a diverse group of participants were invited. Specific coverage was sought for linguistic, neurological, learning, interpersonal learning, and developmental areas. In addition to the coverage of these areas as fields relevant to mental retardation, the conference was intended as a means for considering evaluational and training features of language and retardation. Finally, it was hoped that the discussants would be able to formulate guidelines for further research in this area.

Antecedent to the conference, the planners realized that better programs of speech and language training for the retarded may depend on a stronger body of information from which planning and implementation can be derived. It seemed apparent that the development of systematic programs has been delayed because supporting information has not been available to those charged with initiating the programs. Consequently, we hope that the information presented here will encourage the development of more work with retarded children. The promise and the excitement of this work is clearly suggested in the book.

The conference was planned by staff members of the Bureau of Child Research with generous assistance from Dr. William Carriker, currently Director of Special Education, Pennsylvania State University.

In attendance at the conference were Margaret C. Byrne, University of Kansas; William Carriker; John B. Carroll, Harvard University; Ross H. Copeland, University of Kansas; Elizabeth M. Drews, Portland State College, Portland, Oregon; Thomas E. Jordan, Southern Illinois University; Jack Michael, Arizona State University; Sylvia O. Richardson, University of Cincinnati College of Medicine; Seymour Rosenberg, Rutgers University; Richard L. Schiefelbusch (Conference Chairman), University of Kansas;

Bernard B. Schlanger, The City College of New York; Gerald Siegel, University of Minnesota; James O. Smith, University of Kansas; Joseph E. Spradlin, Parsons State Hospital and Training Center; Mack Steer, Purdue University; Joseph M. Wepman, University of Chicago.

We express special appreciation to Dr. Joseph E. Spradlin, who helped to write the initial conference proposal, to Dr. Thomas E. Jordan, who provided the title for the manuscript, to Mrs. Dixie Rodkey, who prepared the manuscript for the publishers, and to the conference participants who interrupted busy schedules to devote a week of intensive effort to the project and who willingly submitted to further contingencies in preparing the material for this book.

We would like also to express gratitude to the U.S. Office of Education for the funds and encouragement in support of the conference project.

Lawrence, Kansas
July 1967

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LANGUAGE AND MENTAL RETARDATION

EMPIRICAL AND CONCEPTUAL CONSIDERATIONS

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CHAPTER 1

INTRODUCTION

Although the volume of speech and language services for the mentally retarded has increased sharply during the past few years (Leach and Rolland, 1964), the total available resources are still relatively small. One apparent reason for the scarcity of such services is the lack of an organized body of information on which to base highly developed training programs. The major research in speech and language of the retarded has been focused upon the incidence of impairments and the relation of such impairments to organicity and/or to delays in intelligence. However, a few studies have been initiated to determine in what ways the verbal behavior of retarded persons is modifiable (Mecham, 1955; Schlanger, 1958; Kolstoe, 1958; Lassers and Low, 1960; Smith, 1962*a*; Schiefelbusch, 1963; Baer *et al.*, 1965; Risley, 1966; Yoder, 1965; McLean, 1965). These studies have demonstrated that behavior can be modified under carefully contrived conditions. As yet, however, comprehensive language training procedures based upon long-range empirical results have not been developed.

The development of systematic programs for speech and language training, then, presupposes information which is not yet available to those most frequently charged with developing such programs. If it is assumed that the goal is to prepare the retardate to communicate effectively in society, information about the variables affecting communication is needed.

We must have information concerning the language abilities required for satisfactory adjustment in the various situations in which the mentally retarded will be placed. In order to obtain this information, researchers must develop additional procedures for evaluating language, such as those discussed by Spradlin in Chapter 8. Once such procedures are developed, the language requirements within various situations and the degree to which these requirements are met by retarded children can be evaluated. Elimination or reduction of the discrepancy between the retarded child's language skills and the language requirements of the "community" in which he will live should then be the goal of a language training program.

Information leading to such programs possibly will be derived most rapidly in a two-stage process. The first stage involves the assessment, in the light of current or possible future application, of basic principles of human behavior already established by language theorists. These principles are likely to provide the most effective bases for planning language training approaches. The second stage for developing procedures should involve efforts to apply these general principles to the establishment and modification of the language behavior of retardates.

These broad and somewhat optimistic statements may seem to point beyond the practical limits of our professional technology. Nevertheless, we should examine the bases of these statements and make the best applications possible under any and all circumstances. Since this chapter is necessarily an introduction to much of the material to follow, the reader is urged to seek additional basic information in subsequent chapters.

REVIEWS

In 1957 Matthews presented a comprehensive review of research. Since 1957, other reviewers have attempted to pull together all or a portion of the relevant research in speech and hearing of the mentally retarded. These reviews include those of Harrison (1958), Piens (1962), Smith (1962*b*), Spradlin (1963), McCarthy (1964), Spreen (1965), and Jordan (Chapter 2 of this book). Some selectivity has been introduced into the reviews by the different authors. Harrison's and Smith's listings focus primarily on speech and language development of the retarded. Piens lists extensive bibliographies under the categories of speech, hearing, and language. Spradlin deals with language and communication of the retarded with a special emphasis upon evaluation and behavior modifications. McCarthy discusses much of the linguistic research that has appeared in recent years. He emphasizes studies that can conveniently be grouped under the headings "receptive abilities," "inner language," and "expressive language." Spreen examines the literature relative to language and intelligence hoping to throw light on possible lags in language development at variance with intellectual development. Jordan deals primarily with language disorders and introduces certain empirical considerations which add a measure of specificity and interpretive excitement to the evaluation.

Several additional reviews are available in the area of hearing of the mentally retarded. In particular, there are reviews by Kodman *et al.* (1958), Kodman (1963), Schlanger (1961), Webb *et al.* (1966), and Lloyd and Frisina (1965). These compilations and reviews have focused primarily on techniques for audiologic evaluation of the retarded with particular emphasis upon the difficulties encountered in evaluating low functioning children. The variability from the standard audiometric measurements has led to innovative procedures such as operant conditioning audiometry (Spradlin and Lloyd, 1965), vibrotactile techniques (Donnelly, 1965), and slide show techniques (Lloyd, 1965).

One problem encountered by reviewers in any of the speech and language function areas of the mentally retarded is that the studies have been developed by researchers in several fields and have been recorded in a range of different journals and source books. Also the reviews are often undertaken with no general agreement as to the nature of the subject population except to call them mentally retarded and often with little agreement as to the frame of reference employed in evaluating their behavior. For instance, studies have dealt with articulation, voice quality, rate and rhythm, vocabulary, and various other specific features of speech and language behavior. Other studies have recorded a battery of test findings, including a variety of different observed and implied features grouped together under the heading of language. Still others have undertaken the study of children in relation to the wide range of social and interpersonal behaviors. Lacking a consistent definitional framework for studies, the reader has some difficulty in interpreting and in evaluating the findings. A few reviewers, notably Spradlin (1963), have attempted to use consistent criteria of language behavior in reviewing the literature. Such an approach aids the reviewer greatly in interpreting the information presented. It is only in this way that we may bring some consistent interpretation out of the reviews and thus guide our efforts toward a more systematic approach to language evaluation and treatment.

DEFINITIONAL ISSUES

Since about 1959 definitions of the mentally retarded have been changed from an emphasis upon purely intelligence test factors to include other behavioral issues (Heber, 1959). It is now a common practice to refer to the mentally retarded as persons with retarded intellectual development and inappropriate or maladaptive behaviors. The function of *adaptive behavior* tends to highlight the interpersonal language functions. These functions have been defined and evaluated by linguists, psycholinguists, educators, and psychologists in varying ways.

One way to secure a better understanding of the various approaches is to consider the language models they employ. Three useful systems can be represented as *linguistic, psycholinguistic,* and *interpersonal.* Carroll in Chapter 3 defines language as "a system, a code . . . which underlies the actual motor behavior we call speech."

In 1953 Carroll described language as a structured system of arbitrary vocal sounds and sequences of sounds which is used or can be used in interpersonal communication by an aggregation of human beings and which rather exhaustively catalogues those things, events, and processes in the human environment. Carroll, when talking about language, is referring to the *system* including sounds, words, and grammatical patterns that is employed in speech communication. He then contrasts this definition with a definition of speech as the actual behavior of people in using language.

The language code that is studied during the retarded child's language acquisition is, of course, an incomplete code that only partially approximates the more sophisticated language code of the normal adult. Dissimilarities between the retarded and the normal child can also be studied by the linguistic indices to determine the different levels of attainment. It is possible, by using the definitive code of the linguist, for one to get a more complete view of the language process than is possible with data derived from cruder measures, such as *length of response* or *amount of verbal output.*

The linguist is able to describe the content and the form of the child's language, but he does not attempt to describe the communication behavior or the events as they may be influenced by the process of exchange. To a degree this may be accomplished by a psycholinguistic model. As the name implies, psycholinguistics is the combining of the principal procedures of linguistics with the approaches, principles, and techniques of psychology—especially experimental, social, and developmental psychology. The psycholinguist is interested in language as a form of human behavior and, in this regard, is interested in the effects of language upon human behavior. For instance, he is interested in the effects of disordered language processes, both input and output, upon human behavior. In addition, he is interested in modified functioning of the individual as a result of language training.

The latter interest has led to the applications of psycholinguistic approaches to diagnosis and description. Two noted examples of this have been the Semantic Differential developed by Osgood *et al.* (1957) and the Illinois Test of Psycholinguistic Abilities developed by Kirk and McCarthy (1961) from a language model provided by Osgood. The ITPA is comprised of *channels of communication*—auditory and visual input and vocal and motor output; *levels of organization*—representational and automatic-sequential; and *psycholinguistic processes*—decoding, association, and encoding. The system does not analyze language as a code, but it does include the processes that the speaker presumably uses in talking.

Interpersonal language processes are employed by Rosenberg and Cohen, by Spradlin, and by Schiefelbusch in subsequent chapters. The term *interpersonal* refers to a representation of language which includes the input and output channels together with a concept of the reciprocal nature of the process, which we may call a two-person system.

Spradlin (1963) defines (interpersonal) language as the speech and gestures of a speaker and the responses to speech and gestures made by a listener. Interpersonal language also may be referred to as "communication" or "communication behavior." Skinner (1957) has described the behaviors of speaker and listener as composing what may be called a total speech episode. A speech episode is a context in which two or more people are under the stimulus control of each other as they recurrently assume the postures of speaker or listener.

Since language does act on others and since this is the function it ordinarily plays, it is natural that its effects on assemblies of individuals have been the subject of study. In a series of studies of tactical ingenuity, Glucksberg *et al.* (1965) and Krauss and Glucksberg (1965) explored some aspects of the two-person communication process. They found that adults are able to alter their messages on the basis of information received from a listener who makes verbal or nonverbal responses which indicate whether or not the message conveys information adequate for his understanding. Thus a system is set up where the verbal response of the speaker becomes shaped from a nonfunctional event into a functional stimulus. These authors, however, found that this process did not occur with children 33 to 66 months of age. When both the messenger and the listener were children, neither the message nor the vocal feedback of the listener were functional. The message did not function as a stimulus for the correct choice of an object by the listener, nor did the verbal feedback of the listener (when it was emitted) serve to alter the messenger's response. Rosenberg and Cohen provide a comprehensive examination of this process in Chapter 4. Although their system is primarily designed to provide for a study of *referents,* it is also a model for examining two-person language processes.

In summarizing the definitional issues, then, three key terms or categories may be selected: (*a*) speech—the speaking or listening behavior of a single speaking individual; (*b*) language—the system or code that speakers have learned to use, including sounds, words, and grammatical patterns; and (*c*) communication—the language events, including verbal and gestural behavior, that are interpersonal.

SPEECH IMPAIRMENT

Speech behavior as considered by speech pathologists includes four broad categories: (*a*) articulation—the way sounds are formed; (*b*) rhythm—the time relationships between sounds in a word and words in a sentence; (*c*) voice—the sounds produced by the vibration of vocal folds and modified by the resonators; and (*d*) speech usage—comprehension of the speech of others or the projection of ideas through the medium of speech.

In considering the nature of speech impairments, however, we need to agree on more than a definition of the phenomena which we are attempting to evaluate as a function of the child's behavior. If we were limiting our evaluation strictly to deviant features of speaking and listening, we would have a rather simple problem that could be determined by careful use of instrumentation and reliable observers. In practice, however, there is less agreement about the nature of the deviations which should be classified as impairing. Always in the picture is the implicit observer who might not be able to understand the message or who might be offended or annoyed by the nature of the speech behavior that he is attending to. In effect, then, efforts to describe a speech impairment entirely in terms of the distortions of speech production or the faulty processes of listening are certain to be inadequate unless the observer can indeed predict after listening to a sample of the speech whether it will be conspicuous, unintelligible, or unpleasant to most listeners. Standards in this respect then are bound to vary greatly and evaluations of incidence of speech impairments among any population of children and particularly the mentally retarded are likely to vary greatly according to the criteria and standards employed. If in the opinion of the evaluators, a given child's speech is distorted or conspicuous to a degree that would offend a listener, the particular child would be described as *speech impaired.* The label would apply equally well to articulation, voice, or rhythm problems. Our first problem, therefore, is one of consensus or agreement in terms of the criteria for determining incidence figures. Unfortunately, these agreements do not now generally exist. Nevertheless, a great many studies have reported high incidence of speech defects among retarded children. In these studies institutionalized children generally show higher incidence of speech and hearing impairments than is found among special class children in public school settings.

Schlanger and Gottsleben (1957*b*) studied the frequencies of certain speech defects in various groups of retardates and found considerably higher rates of occurrence in the mongoloid and brain-damaged groups than in familial retardates. They found that 95 percent of the mongoloid group had articulation difficulties, 72 percent had voice defects, and 45 percent stuttered. In comparison the brain-damaged group showed 84 percent, 56 percent, and 18 percent, respectively, and the familial retardates, 66 percent, 22 percent, and 10 percent.

Spreen (1965) points out that higher incidence figures, in general, are found for children with very low intelligence scores and that the incidence figures drop as the group level increases. The highest incidence figures are found among institutionalized retardates; Gens (1951) reports 70–75 percent; Bibey (1951), 66 percent; and Schlanger and Gottsleben (1957*a*), 79 percent. In contrast, Donovan (1957) found only 8 percent of 2000 educable mentally retarded public school children to have severe speech defects. Hudson (1958) estimated a 12 percent incidence of defective speech for the educable mentally retarded. The incidence for all school children has been placed at 5 percent (Ainsworth, 1958).

Incidence figures for hearing loss among retardates are also difficult to evaluate or compare (apart from testing difficulties) because of criteria differences among the studies. For instance, Webb *et al.* report that a 15-db loss level in two or more frequencies produces an incidence figure of 40.5 percent whereas a 20-db loss level in two or more frequencies produces an incidence of 24 percent. Loss figures apparently also vary according to the level of retardation of the subjects and the testing techniques employed.

LANGUAGE IMPAIRMENTS

McCarthy (1964) discusses the literature pertaining to linguistic abilities under three headings: "receptive language," "inner language," and "expressive language." This category arrangement is also considered by Jordan (Chapter 2), Wepman (Chapter 7), and Richardson (Chapter 10). Receptive language (input or decoding) and expressive language (output or encoding) represent listening and speaking behavior. (Spradlin considers these two language processes, including methods for evaluating them, in Chapter 8.) "Inner language," however, is less apparent and more difficult to evaluate.

> Inner language ability refers to the facility with which linguistic symbols are manipulated internally. It has been characterized as "thinking in words" and is analogous to Osgood's "association" (1957*a*, 1957*b*). [The concept of] inner language ability appears to be an outgrowth of Piaget's (1926) egocentric speech; a sort of internalized monologue. Regardless of its developmental or theoretical aspects, the term has great utility in organizing the studies on the retarded of which linguistic thinking is a central feature. (p. 6.)

Osgood's association concept, of course, provides the theoretical basis for the auditory-vocal association and the visual-motor association subtests built into the ITPA. McCarthy's reference to Piaget's 1926 work is less specific. Actually a more appropriate reference would be to Piaget's concept of preoperational thought. Flavell's account (1966) of Piaget's position is as follows:

> During the preoperational subperiod the child is transformed from an organism whose most intelligent functions are sensory-motor, overt acts to one whose upper limit cognitions are inner symbolic manipulation of reality.

According to Piaget the paramount requirement for representation is what he calls the ability to differentiate signifiers from significates and thereby to become capable of evoking the one to call forth or refer to the other. The generalized capacity to perform this differentiation and thus to perform the act of reference Piaget designates as the symbolic function. The young infant cannot evoke a signifier (a word) which symbolizes a perceptually absent event (the significate) from which the signifier is clearly differentiated. In other words, there are certain reference-giving cues in infancy, but they are the functional predecessors of the true signifier.

Piaget's argument is that imitation is a function which supplies the infant with his first signifiers, signifiers capable of representing for him the absent significate. What happens, he believes, is that with the growth and refinement of the ability to imitate, the child is eventually able to make "internal" imitations as well as externally visible ones. He is able to invoke in thought imitations made in the past.

The first signifiers have the properties of private symbols rather than of social signs. Consequently, the preoperational child is egocentric with respect to representations. Piaget reports that the child repeatedly demonstrates a relative inability to take the role of the other person. This is clearly seen in the area of language and communication where the child appears to make little real effort to adapt his speech to the listener.

Vygotsky (1962) believed that egocentric speech is the precursor of "inner speech." He believed that egocentric speech is social in character and that, as the child gains sufficient practice and experience, it is gradually transformed into a private (inner) language. He further believed that, when egocentric speech becomes inner speech, significant changes occur. Most importantly, speech no longer is tied to a concrete situation or to a social context. Perception changes from wordless perception of objects to the perception of objects guided by and expressed in words and finally to the ideation of objects represented by word symbols which do not require the object to be present. Thus the word which was originally a property of the object now becomes a symbol of it. (The Rosenberg and Cohen discussion of referents in Chapter 4 provides a view of the complexity of word meaning).

Vygotsky (1962) also assumes that the ability to think, reason, remember, plan, and organize has its basis in meaningful language. He also assumes that if children are inadequately trained in word meanings, they will likely be retarded. Logically, the reverse is also true, and the Russian view offers promise by demonstrating that these disorders can be corrected by appropriate reeducation in word meanings. Some examples are reported by Luria (1961) and by Luria and Yudovich (1959).

In one study children three to five years old were shown two stimuli, a red circle on a gray field and a green circle on a yellow field, and were told to squeeze their right hands in response to the red circle. When the instructions were changed so that the color of the field was the discriminative stimulus, the older children responded correctly, but the younger subjects continued to respond to the circle. When the circle was replaced with an airplane with new instructions of the nature, "When the sunlight makes the sky yellow, the airplane may fly" for the yellow field and "When the weather is bad, the sky is gray, and it rains, the airplane cannot fly" for the gray field. Under these conditions even the three-year-old children responded discriminately to the color of the field. Luria showed with this experiment how speech can influence perception by changing the stimulus value.

Luria (1958) reports another study in which the experimenters covered candy with red and green covers and conditioned a simple discrimination response in children. The discrimination was difficult to establish and easy to extinguish (subjects had to relearn it each day). Then the colors were named for the subjects with the results that the discrimination was learned two and a half to three times more quickly and the response did not disappear after intervals up to seven days.

The significance of this finding should not be overlooked. The verbal mediator facilitates learning and carry-over to situations independent of the given situation and can, therefore, be reinforced more often than just in the external experimental setting. Subjects could use "inner" speech to solidify a concept like "the candy is always under the red cover" without necessarily depending upon the act of lifting the red cover and receiving the candy.

In another study using a discriminative learning paradigm, subjects were instructed to press a right-hand key when a triangle appeared and a left-hand key when a rectangle appeared. The reinforcer was a train which appeared through a door like a cuckoo. The discrimination was learned with difficulty; and when trapezoids, rhomboids, and so on were presented, only the five- to seven-year-old subjects retained the correct response. The author assumed that the younger children's mistakes resulted from attention to acute angles rather than to the number of sides. Allowing the younger subjects to touch the figures and to describe them verbally resulted in significantly fewer errors.

All of the studies reviewed thus far illustrate the facilitating effects of verbal instructions and verbal cues on learning. Vygotsky reports that words in some way seemed to change the children's perception of the task so that a lasting solution could be learned. Vygotsky's "inner speech" may, as a concept, bother some people, and there may be a tendency for some to substitute such terms as "concept learning" or "speech concept" when referring to the language used by the child in problem-solving or task-solving behavior. Regardless of the philosophy ascribed to, however, it seems probable that greater attention to concepts or meanings would enable experimenters to find a hierarchy of language concept units which might be used in instructing children to perform increasingly more complex tasks. Carroll in Chapter 3 offers a challenge to the experimenter in proceeding with this undertaking. He states:

> In studying language development from the standpoint of semantics, we should bear in mind that nearly all grammatical and lexical phenomena in language represent what are ordinarily called "concepts." A concept may be defined as an implicit representation of a class of experiences. Many concepts have names. "Dog," "animal," "living thing," "life" are a few names of concepts—some of them, like "life," are extraordinarily difficult to define or describe in any precise way. Presumably concepts can be ordered in terms of difficulty—perhaps in terms of the number of attributes which define them and the complexity of their relationships.

A study by Stephens (1966) suggests that concept attainment is a special problem of mental retardates. He matched normal and subnormal boys for chronological age and compared them on two aspects of conceptual category usage. Subnormal boys evidence significantly lower performance in tasks requiring independent utilization of a variety of categories for organization of test materials and in ability to provide names for categories which they had used successfully in previous tasks.

The findings indicate that subnormal subjects have considerable difficulty in getting meaning independently from their experiential contacts.

> If independent use of categories is in fact an important tool for getting meaning from experiences, then individuals in whom the relative number of independently used categories is diminished would be expected to find a larger part of their experiences incomprehensible. This suggests that the life experiences of subnormal persons must be subjectively fitted into a narrower range of conceptual categories. Experiences which do not fit readily into this limited range of independently used categories may be for functional purposes unavailable to subnormal persons.

McCarthy (1964) points to a number of other language concept studies of mentally retarded children and adults. Included are studies by Furth (1961, 1963), Jensen and Rohwer (1963), Griffith and Spitz (1958), Griffith, Spitz, and Lipman (1959), Stedman (1963), and Rossi (1963). A more recent study has been conducted by Milgram (1966). Jordan, in Chapter 2, lists a number of additional studies, and his discussion adds considerably to the understanding of concept formation in retarded children. Richardson, in Chapter 10, also discusses "central" or "inner" language as a mediating response. She focuses especially upon the Pavlovian concept of the second signal system as studied by Luria and Vygotsky.

Finally, the importance of language as a developmental aspect of mental retardation is emphasized by Spreen (1965): "An inverse relationship between language handicap and intelligence emerges clearly [from the literature]." The frequencies reported are usually around 100 percent in groups with IQs below 20, around 90 percent in the 21 to 50 IQ groups, and around 45 percent in the mildly retarded groups.

COMMUNICATION IMPAIRMENT

The child who has learned a language in the sense of having acquired a phonology, a morphology, and a syntax still may not know exactly when and where to use that language. Flavell *et al.* (1966) observe that, while the five-year-old has learned to translate linguistic competence into verbal utterance in a number of contexts, he may not have learned to do so in all appropriate contexts.

> Thus, the genesis of language in its broadest sense may entail a progressive linguification of more and more situations. Initially, only a limited number of behavioral contexts call forth speech activity, but this number gradually increases as development proceeds. (p. 297).

Perhaps one function of training, then, is to increase the number and variety of language "games" the child knows how to play. In particular, the teacher or clinician must teach the child to utilize language concepts that are essential to the completion of tasks in his learning situations. In the same sense the child must acquire the skills which enable him to communicate effectively in a variety of social and occupational contexts. Spradlin in Chapter 8 refers to "language required by the community" and suggests that language evaluations should lead to appropriate placement in training so that crucial aspects of the child's language skills may be modified to "more nearly match those of normal members of the community." This implies that the child has a communication impairment unless he can effectively approximate the expectations or requirements of the community members.

Copeland (1965) suggests that retarded children in on-the-job training programs of the secondary school should be given a vocabulary and a set of language concepts which they will use on the job. Copeland's suggestion might lead to the training of referents to increase compatible relations between the retardate and his eventual employers and fellow employees.

Miller and Griffith (1961) concluded that any improvement in the development of concepts may be limited to the materials used in training; that is, the mentally retarded appear to have a limited ability to generalize the concepts they learn. Apparently then, concept training for vocational placement or for community living should, as much as possible, include concepts that are implicit to those settings.

Kolstoe (1965) would go further in assessing the communication situations for which the retardate is trained. He feels that representative situations should be used to develop valid standard requirements. Each individual should be evaluated against such requirements: "In this way the exact inadequacies of the child's performance can be identified, and training and/or environmental modifications can be prescribed" (p. 79). Kolstoe suggests that research should be undertaken to determine the variables which function within the child's communication situation. Further, the behaviors necessary to success should be identified and trained.

The experimental requirements of the arrangement suggested by Kolstoe are extensive and difficult, perhaps too difficult; but he is undoubtedly suggesting a dimension of practical planning that cannot be avoided if we attempt to teach useful communication skills to retarded children and youth.

In anticipation of such developments, we can gain much from reports of dyadic studies. Hollis (1966) has studied communication within dyads of severely retarded children. His experimental problems dealt with "broad problems of communication, social coordination, and social control."

Evans (1965) studied cooperative behavior of retarded children and found that free communication increases cooperation if children are given the opportunity to communicate from the outset of the experiment.

Other interpersonal language studies have been conducted by Krasner (1958), Jaffe (1958), Matarazzo *et al.* (1963), Rosenburg *et al.* (1961), Siegel and Harkins (1963), Nathan *et al.* (1964), and Evans and Spradlin (1966).

These studies employ approaches which generally attempt to establish basic response relationships and to provide for some effective way to evaluate responses in relation to the contingencies of the situation, including the response behaviors described for the "other person."

It seems apparent that in many types of repeated role relationships a child may show behaviors which are characteristic of that relationship and which may be markedly deviant from the behaviors of the child in some other context. Even where the child's behaviors may be somewhat standardized across context and in relation to a variety of people, his behaviors still may be modified simply by altering the contingencies provided by the adult. This altering of contingencies may actually represent a basic change in the reward system the child experiences in the interpersonal situation. Efforts to standardize language in this kind of interpersonal frame of reference, of course, must include the responses of both participants.

The productivity of this difficult approach is evident. Retarded children may communicate poorly for reasons of unsatisfactory or punishing interpersonal histories as much as for inadequate speaking and listening skills or for deficient conceptual development. Consequently, the task of arranging appropriate language environments and communication experiences may be crucial to the process of language training. Of course, an ultimate stage of training must include arrangements which provide contingencies similar to those of the community.

LANGUAGE DEVELOPMENT

Information on language development of the mentally retarded is usually expressed in terms of lags or irregularities. Carroll, in Chapter 3, urges, however, that the slower process of acquisition be utilized as a means for studying language processes. The knowledge acquired would be useful in planning language programs.

Also language development is usually expressed in terms of the child's acquisitions and does not reflect the conditions under which the language is acquired. For this reason I have attempted to describe acquisition from a framework of social interaction. In Chapter 6 I describe the stages of language development in relation to the child's interaction with his physical and human environment. This approach to the language history of the child may provide a means for observing or testing out the effects of relevant environmental variables upon the child's language acquisition. I consider retarded language as evolving at least in part from an unsatisfactory set of environmental conditions.

Much of Richardson's discussion, in Chapter 10, also pertains to early language acquisition. Her emphasis is upon early sensory experience and its apparent effect upon development. She includes an account of experimental work in Russia that yielded data and implications related to the work of Maria Montessori.

Implications for development can also be derived from Wepman's discussion (Chapter 7) of central nervous system dysfunction. In particular he considers input-output dysfunctions as affected by central nervous system dysfunction. If one considers language to be a process involving speaking and listening, the implications of "central conceptual dysfunctions" become apparent.

The discussions in these chapters and in the summary recommendations of Chapter 12 seem to stress the need for further work on the acquisition process. In particular the issues pertaining to possible "readiness" or "critical" or "sensitive" periods should be investigated in a search for possible ways of accelerating acquisition for retarded children. Also, the discussions imply the need for determining the functional issues, both physiological and environmental, which bear upon development. If parents, clinicians, and teachers are to alter the acquisition rates for children with developmental lags, the critical functions must be manipulated within the environmental arrangements that are established, that is, home, clinic, and school.

TRAINING

Chapters 9, 10, and 11 pertain directly to language training. Schlanger, in Chapter 9, describes a model of language which is derived largely from Fairbanks (1954). He presents a series of critical functions which may operate between the information source (usually a speaker) and the destination (listener). The processes of both coding and decoding are analyzed, together with interference factors that may impair the process. He is especially interested in the feedback function, which originates with the listener and apparently modifies the behavior of the speaker. Suggestions for a therapy program derived from his model are provided. He also poses a number of critical questions for the clinicians. Efforts to answer these questions should lead to additional conceptual validity for planning language training activities.

Schlanger's paper also stimulates questions regarding the attitudes of professional personnel who work with retardates. The general idea that "these children can't improve much" seems to be too often encountered. Perhaps this bias may derive from inadequate information or experience on the part of clinicians in the language training session. Schlanger reviews the variables most important to language development apart from the subject's abilities or disabilities and calls attention to various strategies of speech and language emphasis. He also emphasizes the opportunities for language training with special class curricula. Language development programs may compensate to some degree for the detrimental sociocultural factors encountered by the majority of the educable retardates entering special classes. Smith (1966) details the emergence of a program (Peabody Language Development Kits) designed for this specific purpose.

Richardson, in Chapter 10, considers the training approaches of Montessori and discusses applications made at the Child Study Clinic at the University of Oklahoma Medical Center. She relates these approaches to the research principles of the Russian investigators as described by Berlyne (1963). The provocative implications are that early approaches to systematic sensory and perceptual training may provide significant stimulation to language learning.

Drews, in Chapter 11, presents a broad frame of reference stressing the importance of an environment for learning that provides acceptance, love, and recognition. Within such an environment she feels that children, including those with retarded functioning, will learn to behave autonomously and to acquire more humane concerns. Within an appropriately altruistic environment the retarded can live and learn and can also fulfill needed services and occupational requirements even in a society that is becoming increasingly automated and technically complex.

She reports the results of one five-year study of classroom grouping which indicates that slow-learning children function more effectively within homogeneous arrangements which permit them to fulfill instrumental roles. These advantages are contrasted in the heterogeneous groupings, where the able and gifted children do most of the talking and the planning for the entire group. Consequently she advocates that we reexamine our approaches to classroom grouping with greater emphasis upon homogeneous groupings, individualized instruction, and social reward.

Although Michael, in Chapter 5, does not address the issues of training directly, he discusses issues that are relevant. He points out that more than twenty years of research in animal laboratories have resulted in "a rich assortment of techniques, concepts, and principles whose relevance extends to the behavior of all organisms." Michael considers three points of contact between the area of animal research and the language of the mentally retarded. The first concerns the relative ease or difficulty of stimulating different kinds of behavior. He has found widespread misunderstanding regarding the types of tasks that can be taught to the mentally retarded. The second pertains to the importance of reinforcement variables. He advocates the resourceful programming of reinforcement contingencies and the discovery or development of powerful reinforcers. The third area is the development of stimulus control to improve discrimination learning. Under this area he considers errorless discrimination training, sharply contrastive stimulus dimensions, and the gradual elimination of irrelevant stimulus differences. Michael also discusses the application of behavioral principles to human learning situations.

The subsection on treatment in Chapter 12 points up vital issues which should be considered in training programs for the young retarded child. These issues include (*a*) the effects of sensory enrichment and mediation during infancy upon later language acquisition, (*b*) possible systems of sensory input that will lead to improvements in language acquisition, (*c*) special arrangements which seem to produce maximum treatment effectiveness, and (*d*) training effects which will eventually lead to the most effective communication in social and vocational arrangements.

SUMMARY

Several issues of general agreement seem to emerge from the writings of the authors in this publication. First, they agree that appropriate approaches to language training can be developed for the retarded at all ages and at all levels of development. Second, strategies can be worked out for improving the living conditions for children in institutions, other residence centers, and in fact, any setting where retardates are placed for care or training. Third, early training of speech and language skills may facilitate the child's acquisition of adaptive behaviors pertaining to learning, social, and vocational settings. Fourth, the authors are in agreement that gains in language functions may be proportional to the degree of dedicated participation of resourceful, professional personnel. Indeed, the responsibility for planning successful programs rests with the professional worker. Perhaps we cannot now use the low intelligence of the retardate as a rationalization for uninteresting and unproductive arrangements. Hopefully, creative professionals in a number of the human sciences will share this responsibility.

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CHAPTER 2

LANGUAGE AND MENTAL RETARDATION: A REVIEW OF THE LITERATURE

Thomas E. Jordan

A fundamental question which is rarely given sufficient attention is the nature of the condition we call mental retardation. Too often the issue is pursued at the level of formal definitions and their adequacy. More fundamental is the attempt to delineate the areas of functioning which are involved in an ontological sense and to identify those which are affected in a functional sense. Language behavior in retarded persons is relevant for two reasons. First, language behavior and mental retardation have been explicitly related since the time of Mead (1913). It will be recalled that Binet and Simon (1914) defined idiocy and imbecility in terms of communication: verbal communication difficulties characterized idiots, as they termed one group, whereas written communication was the equivalent process in imbeciles. Second, language is relevant because it illustrates the pseudosophistication and partial accuracy of our thinking about retardation. This may be seen in the generalizations used to summarize language development in general (Winitz and Bellerose, 1963) and in the retarded particularly (Moorhead *et al.*, 1961). Partial validity in our ideas about mental retardation is also illustrated by the relatively pessimistic views which have traditionally been expressed concerning the relevance of speech therapy for retarded children. This paper will attempt to examine the nature of our knowledge of language in the mentally retarded and perhaps, by that act, to reduce a little of the ambiguity concerning language and the behavioral complex we call mental retardation. Other presentations may be found in Spradlin (1963), Jordan (1966), and Spreen (1965*a*, 1965*b*).

INCIDENCE

In general a great many studies have demonstrated that language deficiencies in the form of speech defects occur in retarded children (Bangs, 1961; Brandfon, 1951; Donovan, 1957; Everhart, 1953; Gens, 1950, 1951*a*, 1951*b*; Goodwin, 1955; Gottsleben, 1955; Harrison, 1958; Irwin, 1942; Karlin and Kennedy, 1936; Karlin and Strazzulla, 1952; Kennedy, 1930; Kolstoe, 1958; Lewald, 1932; Lyle, 1960; Mathews, 1957; Meader, 1940; Sachs, 1955; Schiefelbusch, 1963; Schlanger, 1953*b*, 1953*c*; Schlanger and Gottsleben, 1957; Schneider and Vallon, 1954; Sheridan, 1948; Sirkin and Lyons, 1941; Tarjan *et al.*, 1961; Town, 1913; Wolfensberger *et al.*, 1963). The frequency of this occurrence has been reported for various populations. Bibey (1951) estimated the incidence in the population of the Training School at Vineland at 66 percent, whereas Gens (1950, 1951*b*) examined the segments of that population on two occasions and estimated the incidence at 60 and 75 percent. An incidence of 79 percent was given by Schlanger and Gottsleben in 1957; this figure was given several years after the estimates previously cited and was based on the total enrollment of patients in the institution. Other studies of institutional populations have been conducted by Daum (1953) and Masket (1958).

An incidence of 79 percent was estimated among children in special classes given by Mathews (1957). A figure of 66 percent was derived by Sirkin and Lyons (1941) from the population of the Newark State School. Sachs (1955) found speech disorders in 57 percent of 210 mentally retarded young persons, and Schlanger (1953*a*) found an incidence of 57 percent in a group of seventy-four children at St. Coletta's school. A figure of 57 percent (articulation errors) based on 1000 educable retarded children has also been reported (Steinman *et al.*, 1963), while 41 percent was recorded by Riello (1958).

The figures given all show a high incidence, and the differences between them reflect not so much inconsistencies as accurate representations of specific populations. Clearly not all retarded persons are alike; it follows that

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the consistency with which retardation is found will vary still more as populations studied reflect more than situational differences. For example, investigators have considered subgroups based on clinical syndromes and severity. Institutionalized retarded epileptics have been studied, and speech defects were found in 76 percent, according to Gens (1951*a*). Twelve of thirty-six mongoloids were stutterers according to Gottsleben (1955). Shover (1945) reported that 50 percent of the 3000 cerebral palsied persons in Illinois were probably speech defective, and Wolfe (1950) found inadequate speech in 70 percent of fifty cases of cerebral palsy. More recently Hammill and Irwin (1965) categorized speech patterns within types of cerebral palsy.

Severity constitutes a significant dimension of mental retardation. Schlanger (1953*c*) analyzed a population between IQ 45 and IQ 70 and found a 60 percent incidence of speech defects. Using subjects below IQ 50, Lubman (1955) found 85 percent had speech defects. Among the more seriously retarded, Sirkin and Lyons (1941) found an incidence of 74 percent. The total absence of language is sometimes encountered in the severely retarded; Karlin and Kennedy (1936) found that 59 percent of thirty-two persons below IQ 20 were mute, and Lewald (1932) gave an incidence of 57 percent in a similar population. Johnson *et al.* (1960) substantiated these findings in their study of trainable children. They observed fewer articulation errors in their brighter subjects. All of these studies indicate that mental retardation and linguistic retardation are correlates. We may conclude that the relationship is documented as a phenomenon. What is not covered by such findings is the nature of the association between the two conditions.

MENTAL RETARDATION AND LANGUAGE DISORDERS

The connection which has been posited most consistently is that between retardation and language defects as independent entities which are connected by a causal relationship. The relationship has been substantiated by several lines of reasoning. Delay in development of speech in retarded children has been consistently reported (Abt *et al.*, 1929; Diedrich and Poser, 1960; Irwin, 1942; Kolstoe, 1958; Lubman, 1955; Meader, 1940; Mecham, 1955; Moorhead *et al.*, 1961; Rigrodsky and Goda, 1951; Schneider and Vallon, 1955; Schreiber *et al.*, 1940; Strazzulla, 1953; Weiss, 1950; Wood, 1957), and mental age, which is a developmental gauge in persons of all intellectual levels, has been found particularly useful in predicting articulatory proficiency in retarded persons (Bangs, 1961). Several investigators have related language disorders to developmental disorders of early origin. Blanchard (1964) related speech patterns to etiology. Beckey (1942) found delayed speech associated with gestation and pregnancy disorders. That investigation touched on issues which Hess *et al.* (1934) considered a decade earlier and which Jordan (1964) has examined recently—namely, the extent to which various aspects of children's functioning, including language, may be understood in the stream of biological development. In general the evidence of these studies suggests that prematurity and other complications of the early developmental period have sequelae which include language problems.

Jordan's (1964) evidence did not find linguistic problems as serious or as widespread as academic and intellectual consequences of early adversity. A clinical observation by Schlanger (1957) may be cited at this point: He reported a great deal of speech in a girl with an IQ of 38 and described her language as an "almost compulsive garrulousness." Undoubtedly the language was poor in content while profuse in output. Copeland (1963) has reported the quantity of vocalization to be greater in low ability than in high ability retardates. These findings should serve to check the tendency to oversimplify the connection between language and retardation. Some types of linguistic disorder, for example, dysarthria, are linked to mental immaturity fairly readily. However, language is other things. Language has a structure, and this aspect needs exploration. A number of studies have shown that the quality of language produced by the retarded is consistently inferior to that of the nonretarded. Abstraction is less common in the language of the retarded, as Badt (1958) and Feifel and Lorge (1950) have demonstrated (see also Bijou and Werner, 1954; Griffith and Spitz, 1958; Hess *et al.,* 1934; Mein and O'Connor, 1960; Papania, 1954). Sentences are often shorter, and the syntax is usually below age expectancies (Carlton and Carlton, 1945*b*; Denhoff and Holden, 1951; Goda, 1957; Mecham, 1955; Mein and O'Connor, 1960).

Language has a high mediating value in the cognitive and behavioral processes of the retarded (Berkson and Cantor, 1960; Degtiar', 1963; Griffith and Spitz, 1958; Luria, 1960, 1963*a*, 1963*b*; Milgram, 1966; Rosenberg *et al.,* 1961; Weir and Stevenson, 1959). Language viewed in this fashion becomes not so much a correlate or a consequence of retardation as a dimension of the nexus of behaviors to which the term "mental retardation" may be applied. Lyle (1959) has observed that language in moderately retarded children ("imbeciles") is characterized by failure to develop beyond stereotyped patterns of speech. The result is a failure to reach a conceptual level of language achievement. More analytically, the Soviet scientist Luria (1963*a*) has considered the role language plays in regulating behavior in retarded children. Speech, he says, "revives traces of past experience" and leads to direction of behavior by means of this "signal system" which allows generalizations from past behavior. Retarded children, according to Luria (1960), cannot use language efficiently to mediate learning experiences. He says retarded children cannot fixate the significance of experience as normals do, and this failure is an expression of neurodynamic disturbance of "the second signalling system." In the United States, Berkson and Cantor (1960) have studied mediation in retarded children and confirmed its role in verbal learning; Griffith and Spitz (1958) and Griffith *et al.* (1959) have studied verbal mediation and its role in the formation of concepts by retarded children. An earlier investigation, conducted by Reiss in 1946, is relevant here, not because it used retarded subjects, but because it self-consciously drew on the Russian tradition of studies on the topic. Recent surprise at Luria's approach to language studies is perhaps a consequence of the failure of investigators to continue the work begun domestically by Reiss. Work in a third country in the style, if not the idiom, of Soviet research has been reported by O'Connor and Hermelin (1959) in Great Britain. The first of their studies suggested the possibility of building learning sets upon semantic lines; the second showed that free associations to previously learned words could also be understood in terms of semantic connections. Another dimension of cognitive behavior is divergent thinking. Both Tisdall (1962) and Rouse (1965) have shown that skills often considered creative, and therefore unlikely in retarded children, can be stimulated to a significant degree.

The studies just considered are different from the concept of language as words which are mispronounced or poorly articulated by retarded children. They suggest that language behavior is a part of the processes involved when we begin to study children who fail to meet important educational and developmental norms. Viewed in this light language is one of the functional (as opposed to *ontological*) attributes of children which may fluctuate as a consequence of circumstance.

A variety of influences may shape language, apart from any putative mental retardation. De-emphasis of the normal processes of family stimulation (Aserlind, 1964), the "fun, food, and friendly companionship" of which Mowrer spoke, is an important factor; and it is common in the rearing of retarded children (Jordan, 1966). Disruption of mother-child relationships depresses speech development in retarded children, according to Lyle (1959). Separation from the family in the form of institutional living shapes the language behavior of children (Badt, 1958). Schlanger (1954) has demonstrated how swift these effects can be. A mean period of residence at St. Coletta's of three years and seven months significantly reduced the length of sentences evoked under standardized conditions. Institutional living is itself a condition which has many forms. Wolfensberger *et al.* (1963) have studied the problem and believe that institutional living need not impoverish language behavior. Lyle's program of linguistic studies (1959) has shown that the impact of institutional living on retarded children is partially determined by attributes of the children themselves. He has found that moderately retarded children who have not developed language prior to entry find institutional living more inhibiting than comparably retarded children who have already developed language. The more advanced of these two groups, however, was less well developed than comparable children matched by nonverbal MA who were not placed in institutions. This is, of course, a reflection of policies on the purposes of institutions and on the values which guide their programing. In a similar vein Jordan and deCharms (1959) found that stories told by retarded children in special classes were significantly longer than those told by matched children for whom no special classes had been available.

Language as a dimension of behavior may be used for an additional form of study, the type we call differential diagnosis. Two aspects of this matter may be studied. First, language gives us the basis for deciding if retardation or some other construct accounts for deviant behavior (Bibey, 1951). Careful study of language may lead us to consider constructs such as autism (Scanlan *et al.*, 1963), deafness (Kodman *et al.*, 1958; McHugh, 1961; McHugh and McCoy, 1954), neurosis (Sampson, 1961), or aphasia (Weiss, 1948; Wolfensberger, 1963) as more relevant than retardation, basically, or constituting what Wood (1959) referred to in her account of over 1000 children as "the primary problem."

Apart from considering language as an explorable dimension of functional behavior leading to better diagnosis, we may also examine it as a dimension with growth possibilities. These may take the primary form of improved language and are illustrated by the outcomes of speech therapy. Articulation can be improved, increasing the efficiency of communicative behavior. This has been demonstrated in such representative studies as those of Donovan (1957), Lassers and Low (1960), Schlanger (1953*c*), and Mecham (1955). Improvement is possible in seriously retarded children, as Lubman (1955) and Schlanger (1953*c*) have shown. In the case of the severely retarded, that is, persons who may generally be mute, progress is also possible. The gain needs to be understood more in terms of growth from the initial linguistic status than in reference to some optimal state of language. Kolstoe (1958) has documented this, as have Schlanger (1959), Spragge (1962), and Wilkins (1961). In such cases progress needs to be appreciated as raising the level of behavior in a human being. It should be viewed as making a change, although modest, in the status of the person. In this sense that all too common paradigm of retardation as a source of language status is quite reversed. Behavioral status is altered by language status; retardation as a pattern of behavior is modified by improvement in one component of the pattern. As an example Bradley *et al.* (1966) have found ITPA gains in children given milieu therapy. An atypical but not ineffective application of chemotherapy (Tolserol) has been reported by Mecham *et al.* (1955).

A secondary form of change is the by-product of attempts to improve speech; it is the commonly reported growth in adjustment and affability by retarded children who have received speech therapy (Donovan, 1957). Rigrodsky and Steer (1961) observed that children who had received forty daily lessons were "more spontaneously verbal," a finding complementary to Mecham's report (1955) that mentally retarded children produce longer sentences after speech therapy. Schneider and Vallon (1955) reported improved adjustment after speech therapy. An increment in personal independence has been measued by Lyle (1959). Wilkins (1961) reported the results of speech development activities in a 29-year-old mongoloid who had only a handful of words at his command. His subsequent status was "more alert, interested, cheerful and assured," as well as modestly improved linguistically.

A third form is exemplified by the work of Smith (1962*a*, 1962*b*) who identified and matched two groups, each containing sixteen retarded children. Instruction was given to one group based on lessons whose content was structured by Osgood's ideas on psycholinguistic processes. After eleven weeks, growth was measured, and the psycholinguistic attainment of the experimental subject was found to be significantly greater than that of the control group. As in Weld's study (1964) gains were not stable when measured later (Mueller and Smith, 1964). Since the initial period of instruction was thirty-three sessions of forty-five minutes, there is reason for optimism concerning more extensive periods of instruction. Precisely what cognitive change is measured when linguistic attainment is tested remains a provocative question (Kirk and McCarthy, 1961).

It is appropriate to point out that linguistic growth is a process we have yet to understand, even in nonretarded children. Categorization of consecutive stages of attainment continues (Tonkova-Yampolskaya, 1965), but the processes of change which underlie the stages are not well understood. This inquiry impinges on retarded children in two ways. One point of view is that retardation of intellectual growth rate provides a paradigm for conducting investigations. The opposite point of view suggests that the study of language growth in the retarded depends on more than intellect. Siegel (1963) and Siegel and Harkins (1963) have shown that adult expectations affect and are affected by the language behavior of retarded children. Concomitant factors must always be considered, elements which are usually disturbed in the life-space of retarded children (Skeels and Dye, 1939; Rigrodsky, 1958).

In general, linguistic behavior constitutes one of the more dynamic aspects of behavior in persons who are considered mentally retarded. Language is a process which shapes and is shaped by other traits. Rather than considering it a thing apart from retardation we should consider language one of the primary dimensions of behavior (O'Connor and Hermelin, 1959). Language is a significant element in the nexus of behaviors to which the term "mental retardation" may be attached with accuracy.

EMPIRICAL CONSIDERATIONS

So far the discussion has considered conclusions about language in the retarded which are supported by evidence. The evidence itself is a legitimate object of inquiry since its adequacy is basic to any conclusions we may wish to draw.

Measures

The evidence gathered in studies of language in the retarded tends to be rather conventional and has been presented in tabular form by Jordan (1966). Age at acquiring speech and its correlates in the form of surveys of incidence have been conducted frequently (Abt *et al.,* 1929; Byrne, 1959; Denhoff and Holden, 1951; Jordan, 1964; Mathews, 1957; Meader, 1940; Moorhead, 1961; Schreiber *et al.,* 1940; Schlanger, 1953*b*; Schlanger, 1959; Strazzulla, 1953; Winitz, 1964). These studies have generally reflected variation in criteria and in the subpopulations from which they have been drawn. In no instance have incidence figures been modified by converting language disability (for example, speech which meets Van Riper's criterion) into language handicap (manifest disruptions of the teaching-learning process), a conversion which would modify the figures on incidence considerably.

Of more direct interest have been the studies of language processes. A series of investigations has examined the abstract-concrete gradient in the vocabulary of retarded children. Badt (1958) used the vocabulary of the Binet Scale and developed an "abstraction score," which was negatively and significantly correlated ($p < 0.01$) with length of residence in the institution. Bijou and Werner (1954) employed fifty-seven words from Thorndike's list. Brain-injured and non-brain-injured subjects differed in modes of definition. After developing a system for classifying definitions on normals and psychotics, Feifel (1949) applied it to children and found that more mature children made greater use of synonyms and explanations in definitions (Feifel and Lorge, 1950). Griffith and Spitz (1958) studied the process of developing abstractions in twenty-six retarded boys. They found that desired abstractions in meaning were facilitated by prior use of the same process.

The syntax of language in the retarded is a fruitful area of study. Samples of language were examined by Carlton and Carlton (1945*a*, 1945*b*). In a study not distinguished by its attention to ecological factors they analyzed grammatical errors of normal and retarded children. The distinguishing feature of oral language in the retarded children was their failure to match verbs and their subjects.

Extended samples of language have been the object of inquiry in deaf children, and the work of the Heiders is an illustration now some two decades old. Subjects other than the deaf have been used (Fairbanks, 1944), and on occasions retarded children have been the object of inquiry. Type-to-token ratios and similar measures advocated by Johnson in 1944 have slowly been applied to assess classes of words and to measure verbosity and repetitiousness. The studies of Mein (1961, 1962), Mein and O'Connor (1960), Lyle (1959, 1960), and O'Connor and Hermelin (1959) in England, and Siegel (1963) and Siegel and Harkins (1963) in the United States have been recent examples of the value of this approach to language. In a representative study Sievers and Essa (1961) examined the structure of language in seventy-four institutionalized children and seventy-four matched subjects living in the community. They found that the use of pronouns, verbs, and prepositions increased with advancing mental age while the proportion of nouns dropped. Recently, Wolfensberger *et al.* (1963) examined the language structure of eighty retarded persons between IQ 18 and IQ 49. Verbosity was studied by means of type/token ratios and was related to mental age. Words were defined as "core" vocabulary when used by over 50 percent of a group of patients. Fringe words, that is, all others, were found to increase more rapidly than the core vocabulary. Complementary studies in the same program of research are reported by Mein (1961) and Mein and O'Connor (1960). Mein found that the progressive drop in nouns found in the oral language of normals was paralleled in retarded persons. Mein and O'Connor analyzed the 28,732 words produced by eighty retarded persons between CA 10 and 30. The vocabularies of individuals whose MAs ranged from 3 to 7 varied in size from 106 to 677 words. Altogether, 2419 different words were produced by the subjects. Repetitiousness of vocabulary has been reported from the Columbus State School as less common in retarded children living in the community than in those living in the institution (McHugh and McCoy, 1954).

The measures referred to so far are among those described in Johnson's 1944 monograph on the evaluation of language. Many had been used routinely before (Dawe, 1942; Smith, 1962*a*; Wood, 1959); not all of them have been used since. The adjective-verb quotient, which has a long history, does not seem to have been applied, although Boder (1940) reports claims for its value as early as the 1920s.

The length of verbal productions has been employed as a measure of language (Mecham, 1955; Schlanger, 1953*b*; Siegel and Harkins, 1963; Webster and Shelton, 1964). It has been used to assess the outcomes of special class segregation (Jordan and deCharms, 1959), the effects of speech therapy (Mecham, 1955; Schlanger, 1953*c*), and the consequences of institutional living (Schlanger, 1957; Sievers and Essa, 1961; Wolfe, 1950). It is a relatively unused measure, and its correlates do not seem to have been fully explored.

An equally neglected, but more important, formulation of language merits attention. In addition to its syntax, English possesses a morphology. The child who believes that the opposite of *nowhere* is *yes-where* has made a significant discovery about the rules of morphological change, namely their variety. Berko (1958) has pointed to the probable relevance of mental maturity for children's progress in morphology. Gerjuoy and Gerjuoy (1965) have reported word associations, and Blanchard (1966) has studied words used when retarded children use abusive and foul language. Investigation of growth in syntax by 106 retarded adolescents has been presented by Goda and Griffith (1962), who studied stereotypy of tense and rigidity of structure.

Phonemes have been studied infrequently. Irwin's program (1942) of studies on speech development in infants has included retarded children, and he has reported on the speech sounds of ten young children with a mean IQ of 29. They used front rather than back vowels, and he described their speech development at about age four as similar to that of normal children less than one year old.

The neurophysiological basis of speech has not been studied in great detail. Meader (1940) based a theory of speech development on the "hypha," which was described as "the smallest physiological unit of speech." Two investigations, those of Schlanger (1953*b*) and Davis (1951), have used diadochokinesis as a measure in their analyses of speech in retarded and premature children. Another physical aspect which has been studied is pitch. Michel and Carney (1964) analyzed pitch characteristics of mongoloid boys, and Hollien and Copeland (1965) studied the issue in mongoloid girls; in both cases deviations were insignificant. In recent years voice disorders have been described in a rare syndrome, the *cri du chat* (Silber *et al.,* 1966; Pfeiffer and Simon, 1965).

Language as cognitive process has received some attention. Rigrodsky and Goda (1951) examined expressive and receptive processes and found that great variability existed in a group of brain-injured children. Generally those who were more advanced receptively were also advanced expressively. In recent years the study of linguistic cognitive processes has advanced through the theoretical foundations described by Osgood and Wepman. Sievers and Essa (1961), and subsequently Kirk and McCarthy (1961), have applied their scales to retarded children with profit.

Subjects

The subjects used in the various studies have been classified in many ways. Severity has been a common dimension with children grouped by IQ and less frequently by IQ and MA (Abt *et al.,* 1929; Batza, 1956; Lubman, 1955; Lyle, 1959; Schiefelbusch, 1963; Spradlin, 1963). Institutionalization has been used on many occasions (Lyle, 1959; Lyle, 1960; O'Connor and Hermelin, 1959; Papania, 1954; Rigordsky and Goda, 1951; Schlanger, 1953*a*; Wolfe, 1950), although only Schlanger (1954) seems to have viewed the condition as separation from the home. In general, institutional living has been tolerated although Wolfensberger *et al.* (1963) believed that their institution in Britain need not be a depriving milieu. Lyle (1959) has combined subjects in several ways. Working with moderately retarded children, he classified them by place of residence—for example, institution, home, or special nursery school—while also using disease for subsidiary analyses.

Retarded children have been studied by clinical syndrome. Mongolism (Gens, 1951; Gottsleben, 1955; Hollien and Copeland, 1965; Kolstoe, 1958; Mein, 1961; Murphy, 1959; Schlanger, 1957; Schlanger and Gottsleben, 1957; Strazzulla, 1953; Weiss, 1950) has been used, as have cerebral palsy (Boder, 1940; Byrne, 1959; Carlton and Carlton, 1945*a*; Denhoff and Holden, 1951; Donovan, 1957; Evans, 1947; Rigrodsky and Steer, 1961; Wolfe, 1950), prematurity (Davis, 1951; Hess *et al.*, 1934; Kastein and Fowler, 1959), phenylketonuria (Diedrich and Poser, 1960), epilepsy (Gens, 1951*b*), cretinism (Schreiber *et al.*, 1940), and brain injury (Bijou and Werner, 1954; Fairbanks, 1944; Gens, 1951; McHugh, 1961; Rigrodsky and Goda, 1951; Schlanger, 1959; Weiss, 1950). Age has been used in several ways (Goda, 1957; Griffith and Spitz, 1958; Schlanger, 1954; Wintz and Bellerose, 1963), and most studies describe children as educable or not although this has not generally been a primary basis of classification. An excellent summary plus original data on hearing loss has been provided by Lloyd and Reid (1967).

Experimental Design

Many studies are normative surveys and give descriptions within defined limits, such as the site of the study, the clinical entity involved, or age. Heterogeneity marks the subjects, and in some instances it seems to have been avoidable. Matched groups have been commonly employed, but language status is infrequently the discriminating attribute. The studies reported from Kansas in 1963 have been an exception to this trend (Schiefelbush, 1963). In the last several years factorial designs have appeared, and sophistication seems more apparent. Correspondingly, clinical reports have been infrequent, and longitudinal studies have been quite rare. The use of linear mathematical models has been suggested by Shriner and Sherman (1967) in order to study language development. The use of computer-based mathematical models can be even more productive in the study of linguistic development (Bottenberg and Ward, 1963; Jordan, 1967). Multiple linear regression techniques have much to offer in the study of language.

LANGUAGE AS AN ISSUE

It is apparent that attention to language in the retarded has increased over the years. Reviews of the literature have been more common; within the last decade (McCarthy, 1954) and the last five years in particular, there have been several relevant commentaries (Goertzen, 1957; Mathews, 1957; Harrison, 1958; Smith, 1962*a*; Spradlin, 1963; Winitz and Bellerose, 1963; Spreen, 1965*a*; 1965*b*). Undoubtedly this trend will continue. We may also expect to see more studies of language as cognitive process as a result of Kirk's work on the Illinois Test of Psycholinguistic Abilities (Kirk and McCarthy, 1961; Smith, 1962*a*, 1962*b*). Such developments are common; Taylor's anxiety scale led to studies on that topic in the early fifties, and that catalytic process will probably be repeated in psycholinguistics.

A desirable development would be the infusion of contemporary ideas on learning into the development of language. In the basic sense this might take the form of applying the Skinnerian paradigm to speech development and speech therapy. The Parsons Language Sample will probably accelerate basic behavioral studies of language (Schiefelbusch, 1963). In a technological sense programmed learning and operant conditioning are certainly relevant to teaching language. The application should be made in order to benefit those who would profit most, the retarded and indeed the aphasic, from whom language has been taken.

A more general need is the definition in functional terms of what a child is, whether retarded or not. For several years I have been struggling with the development of models of classroom process and of the learner within that process. Specification of what a learner is would allow us to categorize criterion measures and to infuse ideas from one behavioral discipline into another. As an example, it is capricious that type-to-token ratios should have been standard linguistic measures in studies of the deaf, but have remained relatively ignored in studies of the retarded.

In summary, it appears that language processes merit attention in refinement of the concept of mental retardation. More precise constructs are needed to facilitate thought on the problem, and it will only be after a great deal of hard but fascinating work that sophistication in the area will develop. Undoubtedly language constitutes one of the prime dimensions of intellect in human beings. The relationship stands as one of the great challenges in mental retardation.

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CHAPTER 3

PSYCHOLINGUISTICS IN THE STUDY OF MENTAL RETARDATION

John B. Carroll

First I must disclaim any special knowledge or competence in the field of mental retardation, per se. I have never worked with groups of mental retardates, nor have I received any special training in problems of mental retardation. At the same time I would like to think that there may be some ways in which this chapter can contribute, first by saying something about the field in which I do feel expert, namely psycholinguistics, and secondly by raising some questions that may be interesting to work with in the study of the language development of mental retardates.

I have made some effort to inform myself about language in mental retardation by checking through various sources, including a bibliography of psycholinguistics which I have been assembling privately over the past two decades. As the result of this survey, I feel strongly that research in this area has not been plentiful and that little real progress has been made. Most of the published articles in the area seem to be reports of rather general surveys that do little more than repeat the oft-confirmed finding that difficulties in language and communication constitute one of the major problem areas for mental retardates. Descriptive studies of the language of mental retardates have often been superficial, having restricted themselves largely to reports concerning sentence length, vocabulary counts, and the like. Some of the most interesting items in my bibliography come from some years ago. For example, Chipman's study (1935) of the vocabulary of mental defectives strikes me as more informative and analytic than more recent studies of vocabulary. Cuatrecasas and Alvarez's article (1938) on syntactical development in mental defectives appears to have explored some problems that have received scant attention since. We seem to know little more in 1963 than we did in 1953 or 1943. Therefore I am gratified to observe the new burst of activity in this field as represented, for example, by the monograph reporting the first results of the Parsons Language Project (Schiefelbusch, 1963).

Actually, what intrigued me about the present conference and impelled me to accept the invitation to attend was the prospect of discussing here some very promising possibilities for using studies of mental retardates to improve our knowledge of child language development in general. In this way we could perhaps develop some notions that would have intellectual and scientific value, and some practical value as well. If there is indeed a language deficit in mental retardation, we need to make a close analysis of this deficit—to determine its nature as precisely as we can. It is here, I think, that we can apply the techniques of psycholinguistics and of linguistics.

Some of the newer ideas in linguistic science, particularly the formalization of grammatical analysis in "generative grammar" by Noam Chomsky (1957), are being tested out in application to language development in normal children. [The interested student can find leads into the relevant literature in publications of Carrol (1958*b*, 1959, 1964) and of Kjeldergaard (1961).] Among studies that have already appeared are those by Braine (1963) and Roger Brown and his associates (Brown and Fraser, 1963; Fraser *et al.*, 1963), and others reviewed by Ervin and Miller (1963). Currently Roger Brown and Ursula Bellugi are following the language development of two normal children very closely. From the protocols they have collected in the natural home situation they find that they can write a "grammar" of a child's speech at a given stage of development. The process is analogous to that which would be followed by a linguistic scientist who goes out to write the grammar of some previously unstudied language native to South America or Africa. The language of these children is developing so rapidly that Brown and Bellugi find they have to write a different grammar almost every month. Indeed, the pace is so rapid that there is danger of missing some of the more important steps in grammatical development. For example, almost overnight one child learned to insert the verb in such phrases as *I'm tired, Mother is working* where before he had said *I tired, Mother working.* (Actually, these phrases represent two different patterns, and the child learned to insert a form of the verb *to be* at slightly different stages of development.)

It occurs to me, however, that in mental deficiency we might be able to observe a sort of slow motion picture of these grammatical developments. Development would, to be sure, be much retarded; but we might expect at least some parallels with language development in the normal child. Whether there are in fact such parallels is an interesting empirical question; and if there are striking differences between normals and mental retardates in stages of language development, this is something we should know about.

Another thing that intrigues me about language development in mental deficiency is the role of language in the development of thought. We have recently become more aware of the degree to which language structure exhibits mental operations of rather remarkable subtlety. We take for granted such linguistic phenomena as grammatical number (singular and plural), tense (present, past, future, and so on), and mode (declarative, interrogative, imperative, and others) without noticing the complexity of the mental operations that these imply. For example, in the case of the plural, note that it is a rather large jump, if you come to think of it, from the notion of *one* card to the notion of *more than one card,* that is, *cards.* To use a plural is in a sense to make an abstraction, for an aggregate is an abstraction. To use a plural is to recognize that a series of stimuli share a group of common properties despite differences that may exist between them. A child seeing a group of cards—some white, some blue, some gray, some big, some middle-sized, some small, and so on—and calling them *cards* is therefore exhibiting the result of a fairly complex mental operation. And for him to go on from there to talk about *all* cards or *some* cards or a *few* cards is to exhibit even more complex mental operations, verging upon those with which the logician and the mathematician must operate.

If young children of normal intelligence show these mental processes, it would be even more remarkable to observe them in mentally retarded children. If we were able to make more careful analyses of the stages in which linguistic phenomena such as these develop, we might have a much better way of indexing mental development. Intelligence tests such as the Stanford-Binet recognize this fact, but fail to provide any really analytic data beyond what can be inferred from their tests of vocabulary.

Finally, there is also the possibility that the mental attainments of mentally retarded children as manifested in language development will reveal themselves as greater than we might otherwise think them to be and that these linguistic attainments can be used as a leverage for other kinds of mental development.

This last statement needs careful explanation. I wish I could present some examples from studies of language development of mental retardates, but since I cannot do this I will give you some examples from some observations I have made of language and thinking in persons of normal or above-normal intelligence. In teaching statistics, for instance, I find that even graduate students have some trouble in acquiring the concept of a *continuum* or dimension along which things may vary continuously. Associated with this is the concept of *variable,* that is, a respect in which things may be observed to vary. In teaching these concepts, I point out that in English (or for that matter, in every language so far as I know) we have a certain grammatical phenomenon that encapsulates the concepts of *variable* and *continuum.* For we can say, "This tree is tall. That tree is taller than this, and that tree over there is the tallest of them." *Tall* is the name of a variable—or perhaps we should say *tallness* or *height.* If we can apply the comparative or superlative degree to an adjective, we have a variable or attribute with respect to which things can vary continuously. Thus, a linguistic phenomenon that people have learned "out of awareness" becomes the key to the conscious understanding of some rather subtle scientific ideas. Perhaps a mentally retarded child who has mastered the formation of the comparative degree of adjectives could in this way be taught the notion of variable and continuum.

Another example is also from the field of statistics. I sometimes find that students have difficulty in acquiring and identifying the concept of correlation. They use the word in the wrong sense—for example they talk about the "correlation" of two groups of people, when they probably should talk about "comparison" instead. It happens that the notion of correlation is contained in a rather common grammatical phenomenon in our language (and similar phenomena occur in many other languages). This is the construction exemplified in such statements as *The more I eat, the fatter I get,* or *The colder it gets, the more fuel we need.* This construction, with the pattern [the (comparative) . . . the (comparative)], implies a correlation between two variables. Amount of eating is correlated with girth; temperature is correlated with fuel consumption. Here again, we have a concept—correlation—that people seem to learn automatically and unconsciously in the process of learning language; by making them conscious of it, we can make them transfer it to various situations where it can be used as a scientific concept.

These are only examples of the many concepts of this sort that are embedded in language and that can possibly be used as levers for filling out gaps in mental development. Whether this can be done with mentally retarded children is an exciting question.

In the introduction to the conference, we were urged to consider various models for language behavior. One model which has been extensively appealed to in recent studies of language behavior of mental retardates is Skinner's model of verbal behavior with its concepts of mand, tact, echoic response, intraverbal response, autoclitic, and so on (Skinner, 1957). This model is useful for many kinds of investigations, particularly where the concern is with the elicitation and stimulus control of speech and communication behavior. There is indeed much promise in the idea of being able to control and shape verbal behavior by the application of modern concepts of operant conditioning, and this possibility will be adequately treated, I am sure, by other participants in this conference. The Skinnerian model, however, does not provide the kind of model of language structure that is furnished by contemporary developments in linguistics.

Perhaps it would be of use to define *language* as linguists define it, and thus to distinguish it from *speech, communication,* and other terms. For the linguist, a language is above all a *system,* a code if you will, which underlies the actual manifestation of motor behavior we call speech. According to the definition of language that I worked out at one time in an effort to attain clarity: "A language is a structured system of arbitrary vocal sounds and sequences of sounds which is used, or can be used, in interpersonal communication by an aggregation of human beings, and which rather exhaustively catalogs the things, events, and processes in the human environment" (Carroll, 1953, p. 10). When we talk, therefore, about the *language* of mental retardates, we are talking, or should be talking, about the system that they have learned—that is, what sounds, words, and grammatical patterns they are able to use in speech communication. When we refer to the *speech* of mental retardates, we are referring, or should be referring, to the actual behavior of these individuals in using language, the amount of talking, the conditions under which talking is elicited, and so forth. Language is properly defined so as to include only vocal communication, including intonation and accent, but excluding so-called paralinguistic features such as gestures. But insofar as gestures may exhibit arbitrary, conventionalized patterns we may speak of *gesture language.* Speaking, listening, reading, writing, and gesturing are thus names for activities utilizing an underlying language code.

Let us return now to the consideration of the nature of a language code. It is convenient to think of a language code in four distinct aspects: (*a*) its phonology—the specification of the units of sound (phonemes) which go to compose words and other *forms* in the language; (*b*) its morphology—the listing of the words and other basic meaningful forms (morphemes) of the language and the specification of the ways in which these forms may be modified when placed in varying contexts; (*c*) its syntax—the specification of the patterns in which linguistic forms may be arranged and of the ways in which these patterns may be modified or transformed in varying contexts; and (*d*) its semantics—the specification of the meanings of linguistic forms and syntactical patterns in relation to objects, events, processes, attributes, and relationships in human experience.

This model of language, it seems to me, should be given appropriate attention in research on the development of language in mental retardation. Studying sentence length is studying speech, not language; studying the development of noun and verb inflections and of syntactical patterns, however, *is* studying language. Furthermore, the study of language development should take advantage of the findings of linguists regarding the basic elements of a language system, rather than assuming that any native speaker is automatically aware of the proper analysis of these patterns or rather than ignoring the problem of analysis completely.

There is evidence (Lewis, 1951) that in normal children, among the first elements of language to be comprehended are certain basic intonation patterns indicating questioning and other elementary communications between adults and children. We ought to find out to what extent these intonation patterns are functional among children that are so mentally retarded that they do not otherwise speak and at what stage they develop in other mentally retarded children.

I gather from a review of the literature on the language development of mental defectives (Spradlin, 1963*b*) that considerable effort has been spent on studying the development of phonology in mental defectives—both in terms of discrimination (reception) and articulation (production). Nevertheless I get the impression that attention has been focused more on "errors" than on norms of development. Despite the availability of the extensive work of Templin (1957), critically reviewed by Ervin (1958), we do not have really adequate information concerning the development of speech sound discrimination and production even for children of normal intelligence. I doubt, therefore, that there yet exists for mental retardates information which is properly based on modern linguistic concepts. For example, Jakobson (1941) has put forth certain notions concerning the order in which distinctive phonemic features are learned by normal children. Berko and Brown (1960) report that very little progress has been made in testing these notions in the case of normal children. It would be of interest to test them in the case of mentally retarded children.

Likewise, very little progress seems to have been made in the study of the morphological development of language in mental retardates. At what point does a child with a given rate of language development start to form plurals of nouns, form past tenses of verbs, or add the *-s* morpheme to indicate third person singular of verbs in the present tense? Some of the psycholinguistic research methods developed by Berko and Brown (1960) could be used to make comprehensive studies of these questions.

One of the more exciting developments in contemporary linguistics is the advent of what has been called *generative* grammar. Generative grammar utilizes a number of ideas that have been around for a long time and never before been formalized as a complete linguistic theory. Credit must go to Zellig Harris (1957), Noam Chomsky (1957), Robert Lees (1960), and others for their contributions toward the development of an elegant theory of language.

Although Chomsky disavows any attempt to use generative grammar as a model of behavior, it is tempting to consider its possible usefulness in psycholinguistic theory. Let us assume that speech behavior is guided by a series of implicit behavioral decisions. These decisions are selections of linguistic elements—words, grammatical elements, and syntactical patterns.

These decisions *generate* speech. The study of language as a system is thus really the study of the elements of the language system that are available for choice and of the interrelationships and the consequences of those choices.

For example, when I start uttering any sentence whatsoever, it is as if I had first to decide the basic form of the sentence—whether, for example, it is to be a sentence with the form

/noun phrase/ + /verb phrase/

rather than the form

"There"/linking verb/ + /noun phrase/

Thus, I have to decide whether it is to be a sentence like

/The boy/ + /is doing it today/

or a sentence like

/There/ /is/ /a boy/ /here/

And I have to decide, as it were, whether the sentence is to be declarative, interrogative, or imperative. Under certain conditions, I may decide to use a declarative sentence form such as: *The boy is doing it today.* If it is to be interrogative, I must decide what *transformation* I am going to employ: a "yes-no" transformation that merely asks for the "truth value" of a proposition, as in the sentence

Is he doing it today?

or a "wh—" transformation that asks for some specific detail, as in

What is he doing today?

or

When is he doing it?

In the limited work that has been done so far, it appears that it is possible to set up a certain finite number of basic sentence types and transformations to account for all possible "grammatical" sentences that might occur. In fact, the remarkable thing seems to be that by approximately the age of six, children of normal intelligence seem to have learned the complete grammatical mechanism of their language that enables them to construe (understand the structures of) any sentence they hear (even though they may not understand all the words, or the "complete thought" of the sentence). The question is: At what rate do mentally retarded children acquire this grammatical mechanism?

Chomsky's generative grammar model implies that language structure can be understood in three phases: phrase structure grammar, transformation rules, and phonological rules.

The *phrase structure grammar* specifies the basic types of sentences or sentence expansions that can exist before the application of transformation rules.

The *transformation rules* specify in what ways the basic sentence patterns can be transformed and in what order the rules are to be applied. For example, in one version of transformation grammar a passive transformation has to be applied to a sentence before a negative transformation. Thus, in order to make passive the sentence, "The man didn't buy the eggs," it would be necessary to "untransform" it to "The man bought the eggs" and to change to the passive, "The eggs were bought by the man," before changing to the negative passive, "The eggs weren't bought by the man." The suggestion has been made that the child learns various transformation rules in the order in which it is necessary to apply them in the construction of sentences. It would seem that such a process could be more readily observed in mentally retarded children, where language development is presumably much slowed down.

The *phonological rules* specify how a given sequence of words can be articulated. For example, phonological rules permit one to speak the words "did you" as (approximately) "dija," whereas the words "lid you" as in "that lid you bought" could not be spoken, according to the phonological rules, as "lija." It would be interesting to find out the order in which mental retardates seem to acquire such rules.

There are already a number of examples of experimental techniques for studying the existence of certain grammatical patterns and concepts in young children and, presumably, mentally retarded children. Jean Berko (1958) tests children by finding out how they would form the plurals of unfamiliar words (actually, nonsense syllables). For example, she would say, "This is a wug" (pointing to the picture of some imaginary creature). "Now there is another one" (pointing to the picture of two such creatures). "There are two ___?___." Most normal children will form the plural correctly, that is /wəgz/ (in phonemic transcription). A similar procedure is used in testing the formation of the past tense: "Here is a picture of a man who knows how to spow" (pointing to a picture of some fanciful activity). "Today he is spowing. He did the same thing yesterday. What did he do yesterday? Yesterday he ___?___." She has even tested for more complicated grammatical phenomena like the comparative degree of adjectives that I mentioned earlier in another connection. "This dog has quirks on him" (pointing to a picture of a dog with a few spots). "This dog has more quirks on him. And this dog has even more quirks on him. This dog is quirky. This dog is ___(quirkier)___. And this dog is ___(quirkiest)___."

Brown (1957) developed a test for the child's recognition of the use of determiners to indicate the form class of words. In one of his tests, for example, he showed the child a picture of a bowl of something that looked like cornflakes or confetti being stirred or kneaded by a pair of hands. Depending upon whether he said "This is a latt" or "This is some latt" or

"This is latting," he would expect the child to choose the appropriate picture from three that showed—respectively, a bowl-like object, a pile of material like cornflakes, or a hand kneading something.

We could also study the development of transformation rules. Lenneberg *et al.* (1964), as a matter of fact, have been studying the development of transformation rules in mongoloid children. Their technique is to present sentences that the children are asked to repeat immediately. The sentences are of various degrees of complexity and thus exemplify various grammatical transformations. For example, the sentence *Peter wants a lollipop and so does Johnnie* is a fairly complicated transformation of the two sentences *Peter wants a lollipop* + *Johnnie wants a lollipop*. It is assumed that if a child cannot repeat a sentence accurately he has not properly mastered one or more of the transformations it exemplifies. By analyzing a child's ability to repeat sentences of varying degrees of complexity, it is possible to infer which transformations have been mastered and which have not. The evidence suggests that transformations are mastered in much the same order in which it is necessary to apply them in the linguistic analysis of sentences.

Working within the framework of a linguistic model would, I hope, counteract the common tendency to assume that the acquisition of language is a matter of acquiring *words*. This assumption seems to have underlain many research studies that, completely ignoring the interesting ways in which words are or are not patterned, have expended much effort on simple word counts. Linguistic and psycholinguistic theories suggest that the primary unit in language behavior is the sentence frame—or more generally, the utterance frame: the pattern in which the parts of an utterance fit.

The notion of an utterance frame can be applied as soon as the young child or the mental retardate starts making utterances that have more than one word. Even the two-word utterances of a young child seem to have a grammar of their own, as Braine (1963) has pointed out. They pattern themselves either on an AX or an XA model, where A stands for some fixed word and X stands for some class of words that can go together with A. For example, a child might ring the changes on the AX model, "Where X?" by saying "Where Sammy?" "Where dog?" "Where ball?" and so on. In the XA model he would vary the first word, as in "Push Sammy," "Pull Sammy," "Hit Sammy," and so forth.

In studying language development from the standpoint of semantics, we should bear in mind that nearly all grammatical and lexical phenomena in language represent what are ordinarily called "concepts." A concept may be defined as an implicit representation of a class of experiences. Many concepts have names. "Dog," "animal," "living thing," "life" are a few names of concepts—some of them, like "life," are extraordinarily difficult to define or describe in any precise way. Presumably concepts can be ordered in terms of difficulty—perhaps in terms of the number of attributes which define them and the complexity of their relationships. The normal child seems to have little difficulty in acquiring a rather extensive range of concepts quite early in life—at least, one would judge so from studies of the vocabulary development of normal children. Study of vocabulary and concept development in mental defectives would perhaps reveal more of the fine structure of ordinary concepts than is possible with normal children.

There are many interesting things going on in the study of the semantics of language development in the normal child. Studies of word association (Ervin, 1961; Carroll *et al.,* 1962; Palermo and Jenkins, 1963) could be replicated with mental retardates, and techniques for administering Osgood's semantic differential (Osgood *et al.,* 1957) to these children could doubtless be worked out.

I have been particularly interested in what may be called the semantics of grammatical transformations. For example, suppose we ask the question: What are the psychological antecedents or stimulus conditions that evoke a declarative sentence in contrast to an interrogative sentence or an imperative sentence? If you want something, you can ask for it in several ways—for example, "I want some milk," "Do you have some milk?" or "Give me some milk." It turns out (Carroll, 1958*a*) that the stimulus conditions that determine the selection of these transformations include such variables as: (*a*) the speaker's perception of the relative amount of information possessed by himself and by his hearer; (*b*) the speaker's perception of the willingness of the hearer to accede to his request; (*c*) the speaker's perception of his social status relative to that of the hearer; and (*d*) the speaker's perception of whether an act is to be performed for his own benefit or for the hearer's benefit. Thus, the stimulus conditions are indeed situational.

Knowledge of these things may have some practical application in the language training of the mental retardate. If the mental retardate has a communication problem, perhaps it is because he has not been sufficiently trained to choose an appropriate sentence type for a given situation. If we use a reinforcement model for the analysis of verbal behavior, perhaps the unit of response that we need to work with is first of all the sentence type or the transformation of it—for example, the choice between a declarative and an interrogative sentence. If we were teaching a computing machine to talk, we would have to start with such simple things; and the same may be true for the mental retardate. We could go on to teach the choice between various types of question transformations—the binary ("yes-no") question versus the multiple-response ("wh—") question, these being quite different in structure.

I would like to make a few remarks about methodology. Many of the kinds of things that could be investigated in the speech of mental retardates would require extensive protocols of speech behavior. Preferably, speech behavior should be sampled longitudinally for individual children. In my brief survey of the literature I could not find any satisfactory protocols of the speech of mentally retarded children. Perhaps I did not know where to look.[1] If such protocols were available it would be interesting to try to infer the degrees of linguistic mastery exhibited by given children at given times. The analysis would seek not so much to index the degree of mastery as to delineate in detail what patterns had been mastered by the child, and in what order. Because of the voluminousness of verbal behavior, one would give some attention to the possibility of making analyses of language structure by high-speed computing machine, as in a procedure devised by Klein and Simmons (1962).

The work of Brown, Berko, and others suggests that progress can also be made by the development of special tests for the presence or absence of various aspects of language development. There is the danger of testing too many things at once, however, and thus not being able to infer exactly what behavior the individual has mastered. As I looked over the Parsons Language Sample (Spradlin, 1963*a*), I felt that although the test might be useful for certain purposes, the tasks presented were far too complex to make possible any useful analysis of language mastery from a linguistic standpoint. Even from the standpoint of the Skinnerian model that avowedly guided development of the test, I wondered whether there was too much complexity. For example, in testing for "mands" the examiner must tell the child what to do; and therefore something beside "mand" behavior is being tested, namely, the child's comprehension. Perhaps we would have to conclude that it is actually impossible to test for the presence of one given response and only that response, but I am not ready to be pushed to that conclusion. In the Parsons Language Sample there is far too little attention paid to what may be called the discrimination testing paradigm, that is, the testing of whether the child can discriminate or respond differentially to two contrasting stimuli. I would recommend that in developing language tests, one should establish the discriminative behavior of the subject as a base line before productive behaviors are tested. Some of the techniques recommended by Lado (1961) for the testing of foreign language competence might be applied in testing the linguistic competence of mental retardates.

I feel that we need to have much better information about the imitative, "echoic" capacities of the mental retardate and his ability to "store" and retain verbal material. I have already mentioned Lenneberg's use of echoic behavior as a means of investigating grammatical capacities of mongoloid children. The imitative capacities of the mental retardate could also be studied from the standpoint of information load. There is evidence in Brown and Bellugi's (1964) current work with normal children that sentence generation is constrained, not only by the sentence patterns and transformations that have been learned by the child, but also by some upper limit to the sheer number of units that can be handled at any given age level. Precisely how this works has not yet been studied in detail; but a rough idea is perhaps conveyed by the observation that a child may utter a sentence with either the subject noun phrase expanded to include a modifying adjective or the object noun phrase so expanded, but never with both subject and object noun phrases expanded. This is reminiscent of Yngve's hypothesis (1960) regarding the maximum constructional "depth" of sentence patterns—the hypothesis that would presumably account for the fact that we do not ordinarily let ourselves get tangled up with sentences like "The car that the man that we told to buy a boat brought won the race." Presumably the constructional depth available to mental retardates is more limited than that available to people of normal intelligence.

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[1] Later I found that Gerald Siegel could make available voluminous protocols of the speech of mental retardates collected in a variety of situations and at different ages. (Professor Gerald Siegel, Department of Speech, University of Minnesota, Minneapolis, Minnesota.)

A further stage in this kind of analysis would be that of studying the storage of memories after varying periods of time. The sort of storage I have in mind is exemplified in some of my work with individuals with poor aptitude for learning foreign languages. One of the most predictive subtests in the Modern Language Aptitude Test (Carroll and Sapon, 1959; Carroll, 1962) is what I have called the Phonetic Script test. This is a test in which the individual has to learn associations between sounds, that is, phonemes, and representations of those sounds in a phonemic transcription. At one time I thought the critical element in this test was simply the ability to make the tie or connection between sounds and visual symbols, but in further speculation and experimentation I finally arrived at the idea that what is critical is the ability to *store* phonetic information in such a way that it is, as it were, identified or tagged. Further, I found that people who get low scores on this Phonetic Script test are also very poor at the task of repeating nonsense syllables after a short time delay filled with other activity. These people can do satisfactorily in repeating (echoing) an auditory stimulus like a pair of nonsense syllables *immediately,* but if they are asked to do ten seconds of mental arithmetic after hearing the auditory stimulus and *then* to echo the stimulus, they (unlike people of high language aptitude, who have no trouble with this task) cannot do so. The auditory image has been wiped away, and they have apparently not been able to "store" the original stimulus in memory in such a way that it can be recalled. I wonder how mental retardates would do with such a task because I recall that it has been asserted (Woodrow, 1917; Smith, 1959) that the mental retardate is not so much deficient in actual capacity to learn as he is deficient in the capacity to retain what has been learned. Even though something is taught to a mental retardate on one day, there is very little saving on relearning. Thus, the problem of language learning in the mental retardate may possibly be a problem of storage.

I would like to conclude by quoting a passage from Eric Lenneberg (Lenneberg *et al.,* 1964) that aptly epitomizes a point of view which is not very different from mine:

Whereas mongoloid children like to imitate gestures, they do not have the ability to imitate sentences in a mechanical parrot-like fashion. There was no evidence that they learned individual items, e.g., phoneme after phoneme, or word after word, which, once acquired, could be strung together in simple concatenation. Instead, the findings suggest that language development in mongoloid, as in "normal" children, consists essentially in the application of a very general principle of language. This principle seems to be applied on all levels of complexity. Specifically, it is a principle of perception of patterns and of classification. The patterns are formed by sound sequences and their principle dimension is time. Short trains of sequences are "stored in bulk" and then operated on *in toto.* The process is analogous to visual perception except that in visual perception the patterns have spatial dimension.

In an abstract sense one might say that the basic language phenomenon is present as an *Anlage* by the time the child stops babbling and further development is merely greater and greater differentiation.

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CHAPTER 4

TOWARD A PSYCHOLOGICAL ANALYSIS OF VERBAL COMMUNICATION SKILLS*

Seymour Rosenberg
Bertram D. Cohen

A typical handbook on tropical fish tells us that the Latin name of one of the more popular aquarium fish is *Betta splendens.* Hobbyists generally use the names *Siamese fighter* or *Betta,* apparently because these names are adequate to refer to this fish in the majority of communication situations. A particular *Betta splendens* in a particular tank may be variously called *Siamese fighter, fighter, Betta, male, fish with the long fins, red fish,* or simply *fish.* In time the children in the house may give him a pet name. All of the names given to our fish are "correct" in the sense that we can think of circumstances for which each name is useful in talking about the fish. We can also think of

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circumstances in which one or more of the names would be incorrect. A young child, for example, may refer to a Betta in his tank by its pet name when talking to a stranger. Unless the pet name is a derivative of a more generally used name, the listener may not know which fish the child is talking about, or even that he is talking about a fish. The popular name *Betta* may also be inadequate if there is a mouth-breeding Betta (*Betta brederi*) in the tank or if the listener is unfamiliar with tropical fish.

The variety of names that are used to refer to this class of fish or to a particular member of the class is typical of the complex relation between names and things. Equally good examples are easy to find for a wide range of referents. (See, for example, Brown, 1958.) The variety of names associated with an object has its counterpart at virtually every level of organization of speech and language. Suppose, for example, we ask each of a group of speakers to compose a single sentence to describe a given object, event, or relationship. The resulting sentences will probably differ not only in the names used to describe any particular feature of the referent, but also in the grammatical structure of the sentence. It is also very likely that different speakers will attend to or ignore different features of the referent. To be an effective communicator, the child must learn which linguistic events are equivalent—whether these events are speech sounds (acoustic sequences of the "same" word), names of a thing, or complex transformations of a sentence.

The child must also learn that a linguistic event can refer to very different things. *Siamese fighter* may refer, not to a fish, but to a pugilist from Thailand. The phonemic string /fæst/ can mean *stuck, rapid, abstain from food,* or a *kind of girl many of us love.* Ambiguous words and sentences abound in human communication. The music critic, in reviewing a concert in his column, may write, "The soprano sang two arias from Wagner while the orchestra played Beethoven." The ambiguous (and possibly amusing) aspects of this sentence would very likely escape readers in the context of the critic's article. Taken out of the context of the article, however, someone might conclude that the singer and the orchestra were at cross-purposes.

Thus, ambiguous words or sentences are sometimes made unambiguous by the linguistic contexts in which they occur. This is not invariably true, however (Katz and Fodor, 1963). The social or physical context, as well as particular information about the world, is often necessary to disambiguate an utterance. A listener may also disambiguate an utterance on a probabilistic basis (Osgood, 1963). For example, one would probably not interpret the statement, "She is an old and dear friend of mine," to mean that the friend is an elderly person. With all these listener skills, utterances are still frequently misinterpreted; that is, the listener incorrectly identifies the speaker's referent.

It is clear that most referents have many names and that many referents can be called by the same name. The proposition that referential language is a code, even an imperfect code, contributes little to the understanding of human communication. The code analogy is a throwback to the old philosophical position that words have (or should have) a one-to-one relationship with their referents. The naming of referents by a speaker and the reactions to these referents by a listener involve perceptual, motivational, intellectual, and interpersonal variables. Figure 4.1 summarizes some of the variables that are important in the psychological analysis of a communication segment. According to this schema, the speaker's utterance is determined not only by the referent, but also by his intention with respect to his listener (for example, to inform him of a relationship, to change his attitude, to deceive him), the speaker's knowledge and perception of his listener (a retarded child, his wife, a professional colleague), the speaker's language repertoire, and the nonreferents (for example, the other fish in the tank) from which he must distinguish the referent. This schema makes clear the futility of attempting to match up names and things—as one might in a code—even in a many-to-many relationship, except as a kind of sociological statistic.

We conjecture, however, that the variables shown in Figure 4.1 generally do not completely constrain the speaker's choice of an utterance. We have already argued that a referent can have many names (or, more generally, "referent responses"). Furthermore, it is certainly reasonable to suppose that for any given circumstance a number of these more-or-less adequate response alternatives are available in the linguistic repertoire of normal adults. We assume that the selection of a particular utterance from among the alternatives in an individual's repertoire can be described by a well-defined probabilistic process.

We have also identified in Figure 4.1 the variables that we consider important in controlling the response of the listener. They are similar to those we have listed for the speaker—the listener's comprehension repertoire, his perceptions of the speaker, the listener's own goals, and so on.[1] We also propose to use a probabilistic process in the analysis of listener behavior. In particular, it is assumed that the process through which the listener identifies the speaker's referent from the speaker's utterance is probabilistic in nature.

In ordinary conversation, the two persons typically alternate as speaker and listener. If we arbitrarily select a communication segment from the flow of conversation, one person can usually be identified as the speaker and the other as the listener. The listener is not an inert object during the communication segment. He may inject an occasional *uh-huh* or head nod, a grimace, a change in eye contact, a shift in body position, and so on. Even the latency with which the listener changes his role to that of the speaker may be of significance for the interaction. On the basis of these subtle and complex listener reactions, a speaker may change the subject (new referent), change his goal, explain further (select a new utterance), or terminate the interaction. The speaker may gradually alter his perception of the listener;

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[1] The effects of these listener variables have, of course, been the subject of considerable empirical investigation in studies of persuasive communication.

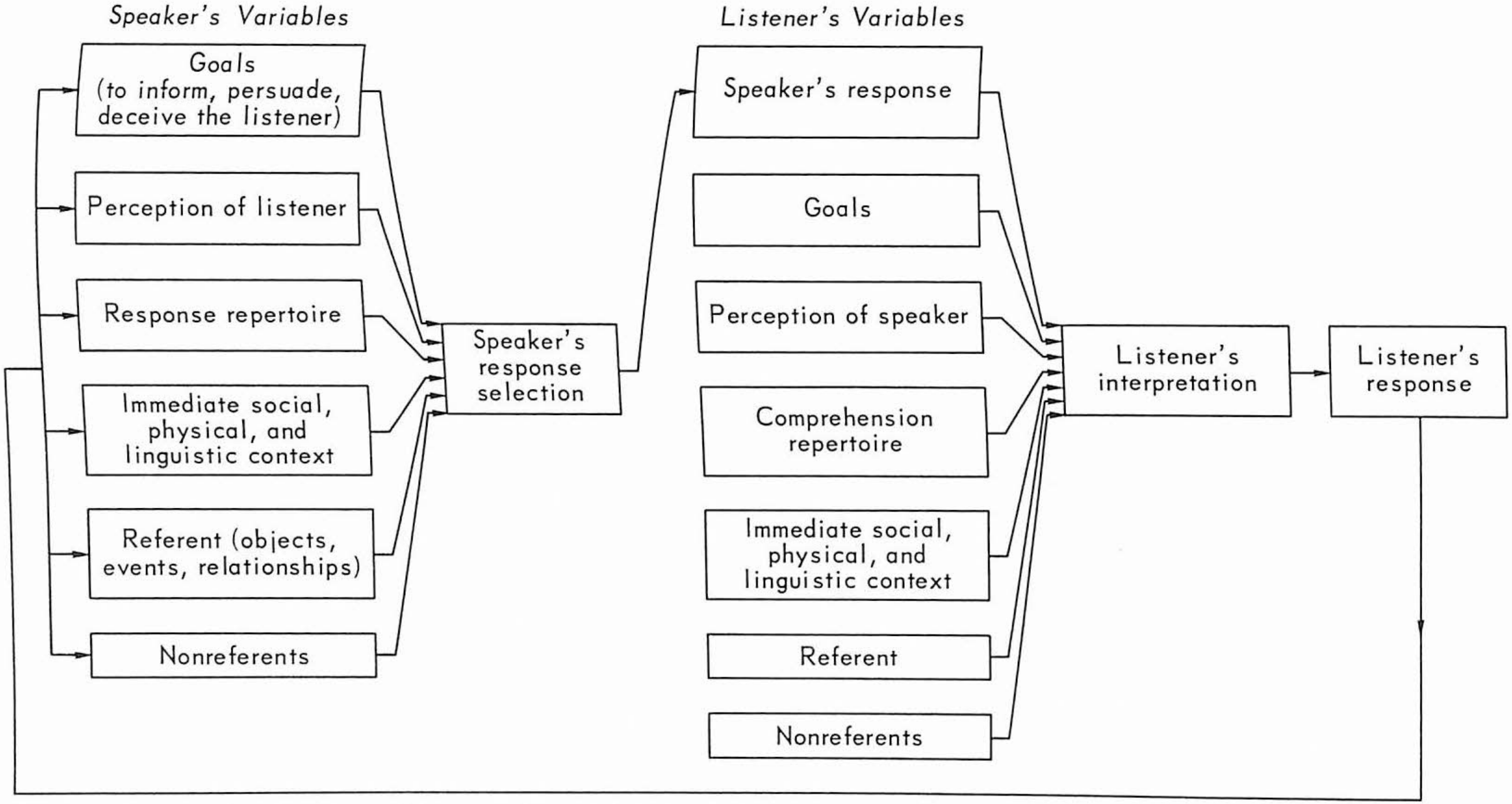
Speaker's Variables
Goals (to inform, persuade, deceive the listener)
Perception of listener
Response repertoire
Immediate social, physical, and linguistic context
Referent (objects, events, relationships)
Nonreferents
Speaker's response selection
Listener's Variables
Speaker's response
Goals
Perception of speaker
Comprehension repertoire
Immediate social, physical, and linguistic context
Referent
Nonreferents
Listener's interpretation
Listener's response

FIGURE 4.1 *Variables of speaker and listener in the psychological analysis of a communication segment.*

and this may in turn affect what he talks about, his intentions, and his choice of language. The arrows from the listener's response to the speaker's variables in Figure 4.1 are intended to point up these effects. Similar changes (not shown in the figure) in the listener's goals, perceptions, and overt reactions may occur as a result of his interactions with the speaker.

Can we formulate the numerous questions that arise in language pathology in terms of the variables discussed above? The communication segment outlined in Figure 4.1 is a relatively short-term event, whereas language pathology develops and is maintained over a protracted period. We have noted, in a general way, that alterations in the perceptual and motivational variables shown in Figure 4.1 can take place as a result of an individual's continued interactions with another individual. There is some evidence that the linguistic and nonlinguistic behavior of an individual is systematically affected when he interacts with someone who displays a communication disorder. It has been shown, for example, that normal adults restrict the diversity of language they use when talking with retarded children (Siegel, 1963; Spradlin and Rosenberg, 1964). Also the more retarded the child is, the less likely are other persons to interact with him (Rosenberg *et al.*, 1961). Chronic social isolation or restriction in the diversity of language to which he is exposed can, of course, deprive the retardate of the kinds of stimulation he might require for more nearly normal development.

The dynamic properties of social interaction make it difficult to analyze in detail the communication skills in which the retardate is deficient. One research strategy is to complement studies of communication in the retardate with studies aimed at the discovery of basic communication skills in normal adults and to describe the acquisition of these skills in normal children. Communication pathology may then be studied in terms of defects in one or more of the skills involved in the total communication process. This chapter describes the initial stages of a program of research in which an attempt is made to analyze the speaker and listener skills of normal adults and children.

INVESTIGATION OF REFERENTIAL PROCESSES

In order to investigate referential processes, it is important to be able to identify a speaker's referent. It would seem that the identification of the referent is not a serious problem. Yet, in natural communication the referent is identified only by inference from the speaker's response. The use of the speaker's response to identify the referent can be unreliable when an utterance can have a number of referents, when a speaker makes a poor choice of a response to distinguish a referent from the possible nonreferents, and when the effects of motivational, perceptual, and intellectual variables are not well known. In short, the psycholinguist is hardly in a better position than any listener in identifying the speaker's referent; thus, he is subject to the same communication processes and errors that he is attempting to understand. Added to these difficulties is the fact that overt discriminative listener reactions to the speaker's referent often do not (or cannot) occur at all in conversation or in reading. It is not surprising, therefore, that the investigation of referential processes by psycholinguists has been primarily anecdotal—a few examples of referents and linguistic responses typically bear the burden of relating theory to communication events.

We propose an experimental paradigm for the study of referential behavior in which many of the variables can be made observable and not inferred from the behavior under analysis. The simplest form of the paradigm is as follows. A referent stimulus is assigned to the speaker by the experimenter. The nonreferents from which the speaker is to distinguish the referent for his listener are explicitly given. The speaker's task, then, is to provide his listener with a linguistic response so that the listener will be able to pick out the referent from the given stimulus array. The listener's task is to identify the referent in the stimulus array by means of the speaker's response.

In most of our studies, the stimulus array consisted of word pairs. The experimenter designated one member of each word pair as the speaker's referent and the other as the nonreferent. The advantages of using words rather than "things" as stimulus material will be apparent later.[2] The speaker's task was to provide a one-word clue that would enable the listener to identify the referent word correctly. The speaker was instructed to give a clue word "that has some understandable connection with" the referent and not one that simply "sounds like or is spelled like" either stimulus word. The listener's task was to identify the referent word from the two alternative possibilities by means of the speaker's response.

Consider, for example, the synonym pair DEMON-DEVIL with DEVIL as the referent. Examples of permissible and effective (for listener's referent identification) speaker's responses include *Lucifer, crab, red,* and *Webster.* A permissible, but probably ineffective, speaker's response is *bad.* Most of the word pairs used in our studies involving adult subjects were synonym pairs. The choice of synonym pairs was motivated by the thought that the responses associated with the referent are likely to overlap considerably with those of the nonreferent and that the effects of the nonreferent on speaker behavior are most salient under conditions of high overlap. A number of unrelated word pairs, like BUY-ATTACK, was also included. For studies involving children, we used word pairs which might be thought of as "coordinates" rather than "synonyms," like PRINT-WRITE. The method is, of course, amenable to other types of word pairs, for example, supraordinates (ANIMAL-DOG), antonyms (BLACK-WHITE), pairs related in experience (TABLE-CHAIR), and so on.

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[2] Linguists and philosophers concerned with semantic problems often distinguish between words (signs) and "things" (referents or objects). From a psychological standpoint, it is important to maintain a distinction between referential responses and referents. Any stimulus, however, can function as a referent. There is no reason to restrict the term *referent* to nonverbal stimuli. Thus, spoken or printed words, as well as nonverbal stimuli, can function as referents.

The experimental method can also be readily adapted to nonverbal stimuli, to more than one nonreferent stimulus, and to complex speaker responses (phrases, sentences, and so on). Carroll (see Osgood and Sebeok, 1954, p. 200), Lantz and Stefflre (1964), Maclay and Newman (1960), Maclay (1962), and Werner and Kaplan (1963), for example, have described similar experimental situations for studying the communication of nonverbal stimuli. A related technique involving nonverbal communication responses was also recently described by Lewis and Pask (1964).

In terms of our schema in Figure 4.1, this laboratory paradigm permits us to identify the speaker's referent and nonreferents, the speaker's goal, the listener's goal, and the listener's response. The results obtained from the illustrative study described in the next section also suggested a way of identifying the speaker's and listener's language repertoire independently of their behavior in the communication task. As we shall see, the identification of these repertoires is considerably simplified by the use of verbal stimulus arrays and by the restriction on the speaker that he limit himself to single-word responses.

ILLUSTRATIVE STUDY

This study is reported primarily to illustrate the experimental method and the type of data obtained in the task. Eighteen pairs of college students were each shown 149 pairs of synonym words, one word pair at a time. The speaker and listener in each pair of subjects could not see each other, and neither subject knew whether or not the listener correctly identified the referent.

Several pairs of subjects were fraternity brothers, friends, or classmates. The inclusion of such subject pairs made it possible to explore, at least informally, the sensitivity of the method to variations in the interpersonal relationships of the pairs and in the speaker's and listener's perceptions of each other. In subsequent studies, prior interpersonal relationships and perceptions were more closely controlled.

The protocols from three synonym pairs are shown in Table 4.1. These protocols contain specific examples of the effects of the interpersonal relationship between the speaker and listener. The speaker who gave *Fromm* to refer to FREEDOM was enrolled in the same course in personality as her listener; Fromm's *Escape from Freedom* had recently been discussed in class. The speaker who used *Fritz* to refer to COMMAND was a fraternity brother of his listener; one of the members of their fraternity was nicknamed "Fritz, the Commander." These "social effects" are not limited to the small subcultures created by the classroom or the fraternity house. The popular and effective use of *queer* and related words (*fairy, homo,* and others), for example, to refer to GAY may not occur at all among speakers from another English-speaking country or from some segments of the population of the United States.

It is probable that the speaker's behavior will also be affected simply by ascribing certain psychological properties to a stranger, that is, altering his perception of the listener. Whether or not a scientist uses *science* to distinguish LAWFUL from LEGAL, for example, may depend upon whether or not he is told that his listener is also a scientist.

These examples also suggest that the sensitivity of the task to interpersonal and person-perception variables depends upon the referents that are to be communicated. The fact that a speaker and listener are scientists, for example, may be irrelevant in communicating LADY in LADY-WOMAN. This is not surprising; an individual can typically discuss many nontechnical topics with persons of different occupations, of different age and educational levels, and from different parts of the country without serious changes in his choice of language.

The effectiveness of most of the speaker's responses in Table 4.1 does not depend on the existing interpersonal relationship between speaker and listener. There is little reason why speaker's responses that are understandable only

TABLE 4.1 *Frequencies of Speakers' Responses and Listeners' Errors in Sample Protocols from a Study of Eighteen Speaker-Listener Pairs*

FREEDOM-LIBERTY[a]		COMMAND-ORDER		GAY-CHEERFUL	
academic	2	*hair*	2	*queer*	5
rider(s)	2	*allied*	1	*Ben*	1
bondage	1	*army*	1	*exhilarated*	1
bus	1	*chain*	1	*fairy*	1
circus[b]	1	*cigarette*	1	*happy*	1
democracy	1	*direct*[b]	1	*homo*	1
four	1	*exclamation*	1	*homosexual*	1
Fromm	1	*force*	1	*joyful*	1
jail[b]	1	*Fritz*	1	*light*	1
land	1	*general*	2	*liquor*	1
nondetermined	1	*general*[b]	1	*lively*[b]	1
sexual	1	*hunger*	1	*Paris*	1
slave	1	*military*	1	*party*	1
slavery	1	*official*	1	*wild*	1
speech[b]	1	*short*	1		
unchained	1	*tell*	1		

[a] The first word in each pair was the referent.
[b] These responses resulted in a listener error.

to a friend, fraternity brother, or classmate need occur. The repertoire of responses to a referent that the speaker has in common with other adults in the culture is adequate to communicate most of the referents that were used in this study.

Indeed, many of the speaker's responses obtained in this study appeared to be a subset of the word associates that would have been given to the referent stimulus alone in a standard word association task. However, the speaker's selection of a response from among the associations to the referent appears to take into account the associative strengths of the response to both the referent and nonreferent. Thus a response which is a strong associate to the referent may not be used by the speaker in the communication task if it is also a strong associate to the nonreferent. On the other hand, a relatively weak associate may be used, given that the speaker "thinks of it" and that its association to the nonreferent is even weaker or nonexistent.

The choices by the listener also appeared to be explicable in terms of the associative strengths of each stimulus word to the speaker's response. A listener's error was more likely to result from a speaker's response where the difference in associative strength between referent and nonreferent was small.

Using these observations as a starting point we constructed a formal theory of speaker and listener behavior in this task in which basic quantities of the theory were estimated from standard word association data. A mathematical version of the theory is available elsewhere (Rosenberg and Cohen, 1964, 1966). The essential psychological notions of the theory are summarized below.

REFERENTIAL PROCESSES OF THE SPEAKER

We postulated that the speaker's *response selection* (see Figure 4.1) can be analyzed into two separate processes or stages, which we term *sampling* and *comparison.* The sampling stage always precedes the comparison stage. Both of these stages are assumed to be probabilistic. A diagram of the two-stage speaker process is given in Figure 4.2. The diagram is essentially a more detailed view of the response selection segment of Figure 4.1.

In the sampling stage, a response is randomly sampled from the distribution of word associates of the referent stimulus alone. The probability of sampling a response is proportional to the probability of its occurrence as a word associate. If, for example, the referent stimulus is CONTENTED, the most probable response that is sampled (not necessarily emitted) is *happy.* Other responses with lower sampling probability include *cow, satisfied,* and *pleased.* In short, the probability of sampling a response is not the same for all responses associated with the referent. In the case of a nonverbal referent, the underlying repertoire of the speaker consists of a distribution of names associated with the object. The names of a nonverbal referent are assumed

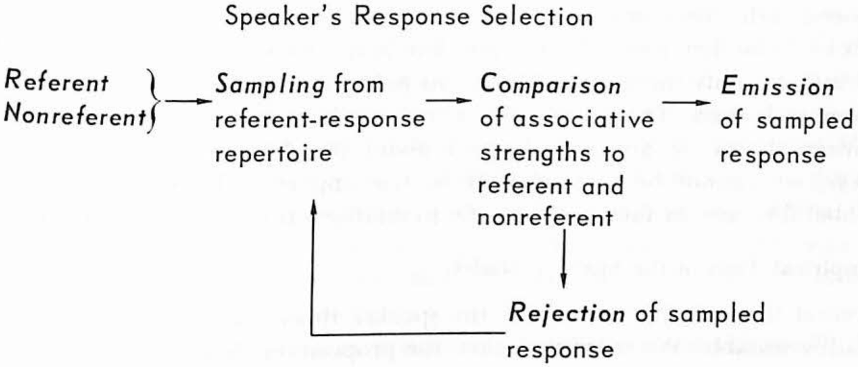
Speaker's Response Selection
Referent
Nonreferent
Sampling from referent-response repertoire
Comparison of associative strengths to referent and nonreferent
Emission of sampled response
Rejection of sampled response

FIGURE 4.2 *Sketch of the two-stage process through which a speaker selects a response.*

to be sampled by the same probabilistic process as word associates of a verbal referent.

In the comparison stage, the relative associative strengths of the sampled response to each of the stimuli in the array (referent and nonreferents) determine the speaker's decision to utter the sampled response or to reject it. The comparison stage is probabilistic in the sense that we assume that the decision to emit or reject the sampled response is a probabilistic function of the associative strengths.[3] The comparison stage might be thought of as analogous to flipping a biased coin with the bias being determined by the associative strengths. For example, although *happy* has a high probability of being sampled when CONTENTED is the referent, it will with high probability be rejected in the comparison stage when, say, SATISFIED, is the nonreferent. Also, a sampled response to the referent may be the nonreferent itself, for example, *satisfied.* If so, it is almost certain to be rejected in the comparison stage. Interestingly enough, a speaker occasionally emits the nonreferent as a clue word when it is a high-probability associate to the referent.

If the sampled response is rejected, the two-stage process is repeated. That is, a response is again sampled and associative strengths are compared. What happens to the probability of again sampling a response following a rejection in the comparison stage? The simplest answer is that the probability of again sampling a rejected response remains unchanged. An alternative is that the probability of again sampling a rejected response is reduced. Both of these alternatives correspond with our subjective impressions of the process; after rejecting a response, we often consider it again or "cannot think of another name." The question is not easy to answer empirically because the only thing we observe is the proportion of times that a particular response is used. This proportion is the result of *both* sampling and comparison. Until we are more certain about the details of the comparison stage, we cannot be sure whether or not apparent changes in sampling probability are, in fact, attributable to changes in the comparison stage.

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[3] It is, of course, possible to think of the comparison stage as deterministic rather than probabilistic. That is, at any given time an individual has a probability of either zero or one of emitting a sampled response. With such a formulation, any changes in the speaker's decision over time would be accounted for by learning or other changes in the state of the individual. It appears that the deterministic and probabilistic formulations are difficult to distinguish empirically. The resolution of this question will probably depend, in the long run, on which approach proves more fruitful.

Empirical Tests of the Speaker Model

Several fundamental aspects of the speaker theory we have proposed are readily testable. We examined, first, the proposition that a speaker samples from an underlying set of responses which can be identified from the word associations to the referent alone. This proposition is expected to hold regardless of the detailed nature of the comparison process and regardless of the number of times a speaker cycles through the sampling and comparison stages.

In order to test this and other propositions, we chose to work with groups of relatively homogeneous subjects, the ubiquitous college undergraduate male. Using male undergraduates at Rutgers, we first collected word association data on each of the referent and nonreferent words used in the two-person study. We then obtained a new group of Rutgers male undergraduates and gave them the speaker task. A group of 108 subjects were each given fifty synonym pairs in one of two orders. The synonym pairs were projected on a screen, one pair at a time. The speakers were given twenty seconds to write down a clue word to distinguish the referent in each synonym pair. Speakers were told that their responses, along with the synonym pairs, would be given to listeners—other Rutgers students—at a later date.

With the task in this form, each speaker knows only that his listener is linguistically similar to himself and is another male student from the same university. We have thus "standardized" to some extent the perceptions of the speaker concerning his listener.

In determining whether speaker responses are a subset of the associates of a given referent, it is necessary to take into account the fact that word associates from a given sample are likely not to contain all the relevant responses in the speaker's repertoire. Put another way, if we were to obtain a new set of associates from a similarly selected sample of subjects, the overlap with the first set of associates would, in all likelihood, be incomplete. Thus, we may not find all of the obtained speaker's responses in any given set of word associates even though the sampling assumption is correct.

In order to test the assumption, therefore, the proportion of speaker's responses present in word association data was compared with the proportion of word associates (tokens) found at least once in another independent sample of word associates to the same stimulus.

Figure 4.3 illustrates this comparison for one referent. The graph on the bottom was obtained from a set of 108 word associates to SLEEPY. Response types are on the abscissa and are arranged in order of decreasing frequency of occurrence. The shaded area represents word associates in the sample of 108 which were found at least once in a new sample of 164. The graph on the top was obtained from a set of 108 speaker's responses when SLEEPY was the referent and DROWSY the nonreferent. Again, the shaded area represents *speaker's responses* which were found at least once in the sample of 164 *word associates* to SLEEPY. We have equated the various sample sizes for obvious reasons.

For twenty-five of the stimulus words used as referents in this study, the average proportion of 108 word associates found at least once in an independent sample of 164 word associates was 0.56. We can think of this proportion as an estimate of norm reliability. This figure is somewhat low because word associates which would have been inadmissible as speaker's responses, for example, the nonreferent word, were deleted from the set of 108 word associates. Of course, 0.56 is the average proportion of the remaining words found among the 164 word associates.

The average proportion of 108 speaker's responses that were found at least once in word association data based on 164 subjects was 0.53—satisfactorily close to the estimated norm reliability of 0.56. One would expect that the percentage of speaker's responses contained in word association norms will increase with larger samples of word associates. This, in fact, happens. For example, we recently completed a study in which eleven Kent-Rosanoff words were the referents. Using all the published and unpublished college student norms that were available to us, we found that an average of 80 percent of the speaker's responses to the eleven Kent-Rosanoff words were accounted for by the accumulated word association norms (2340 students).

Speaker's responses not found among the word associates were almost exclusively low-frequency speaker's responses. The location of the unshaded area on the top graph of Figure 4.3 is typical. In short, word association data appear to be satisfactory for identifying the relevant repertoire of a speaker in the communication task.

Next, we examined certain fundamental properties of the speaker's comparison stage. We were mainly concerned with whether this stage is governed by the relative associative strengths of the referent to the sampled response and of the nonreferent to the sampled response. One way to approach this question is to contrast a one-stage sampling theory for the speaker with the two-stage theory. In the one-stage theory, the nonreferent is assumed to have no effect on the speaker's choice of a response. In the absence of a comparison stage, the proportion of times a word occurs as a speaker's response is completely determined by the proportion of times the word occurs as a word associate to the referent. The two-stage model, by contrast, predicts a depression in the frequency of words (as speaker's

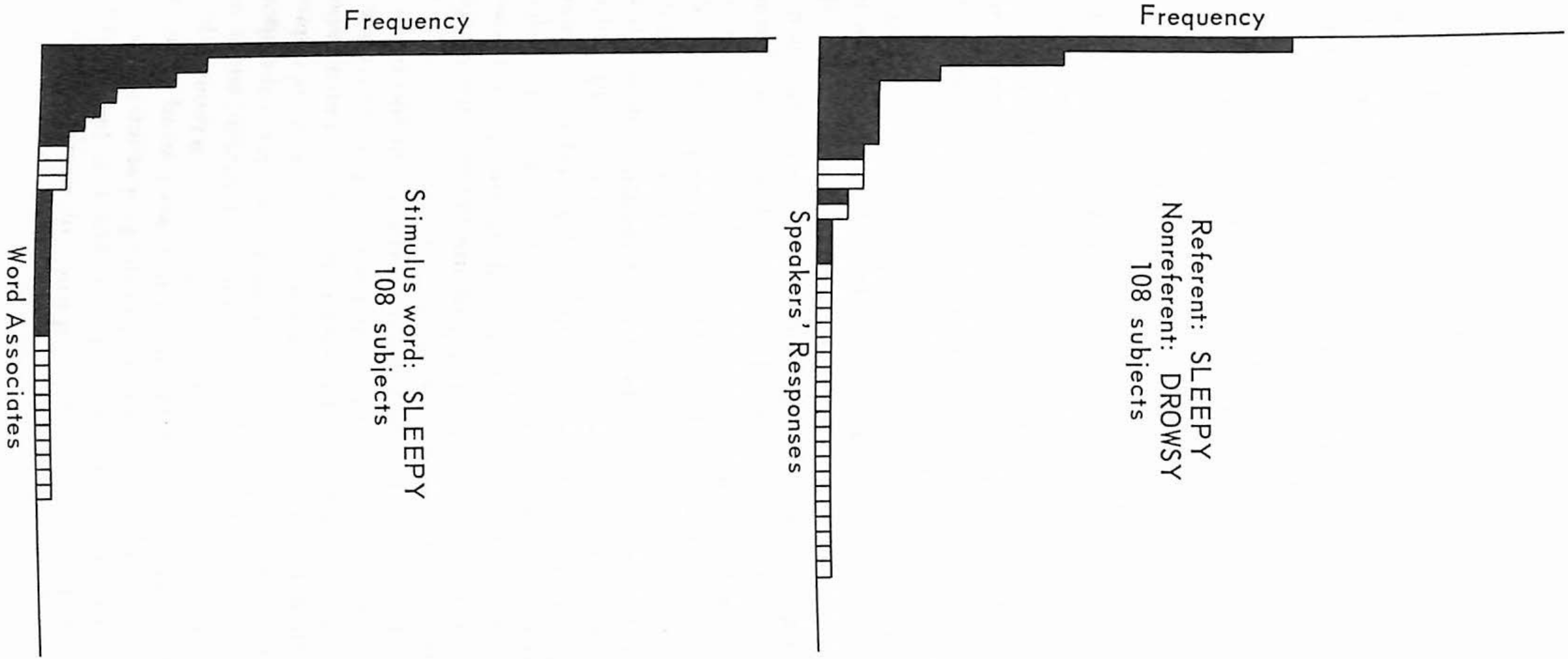

FIGURE 4.3 *The graph on the left is the rank-frequency distribution of word associates to SLEEPY. The graph on the right is the rank-frequency distribution of speakers' responses to SLEEPY when DROWSY is the nonreferent. Dark areas are responses found at least once in an independent sample of 164 word associates to SLEEPY.*

responses) that are also associated with the nonreferent. In the case of stimulus words that are synonyms, word associates that apply to both referent and nonreferent are often the high-probability word associates. For example, the associate to both QUICK and RAPID in more than 45 percent of responses is *fast.*

The effects of a comparison stage would thus be particularly noticeable for the high-probability word associates since their associative strengths to referent and nonreferent are both high. That is, the speaker will tend to reject the high-probability responses because of their similarity in associative strength to responses in the nonreferent set; low-probability responses, on the other hand, will be more likely to be emitted when they are sampled.

It was found that speakers produced fewer high-probability word associates and more low-probability word associates than one would expect if speaker's responses were determined by a one-stage sampling model. A more detailed presentation is given in Rosenberg and Cohen (1964).

Interestingly enough, the existence of a two-stage process is also reflected in speaker's response data from unrelated word pairs, for example, BUY-ATTACK, WHOLE-FEAST, and others. For unrelated word pairs, the two-stage model predicts an increment in the probability that a speaker will emit high-probability word associates of the referent and a decrement in the probability that he will emit the low-probability word associates. Note that this prediction is in direct contrast to that predicted for synonym pairs. The one-stage model, of course, predicts no change in probability. The empirical results, based on ten unrelated word pairs given to 272 speakers, are shown in Figure 4.4. The observed relationship between the two curves is that predicted by the two-stage model. The χ^2 value comparing the frequencies of response types given as word associates and as speaker's responses was significant beyond the 0.00001 level.

The intuitive explanation for the finding shown in Figure 4.4 is as follows. For unrelated word pairs the lower the associative strength of a sampled word to the referent, the closer the value of its associative strength to the nonreferent, the latter being the minimum possible value of associative strength. Hence, the speaker will probably judge remote associates as inadequate to communicate the referent to his listener. Also, unrelated nonreferents are not likely to have any high-probability associates in common with the referent. Hence, whenever a high-probability associate is sampled, the speaker will probably judge it as an adequate communication. The net result of these processes in the case of unrelated nonreferents, therefore, is to constrain the speaker towards clue words of higher communality than he might emit in standard free word association.

Effects similar to those obtained for synonym pairs and unrelated word pairs were also observed by Krauss and Weinheimer (1965) in a study of the communication of colors. They demonstrated that when the hues of the nonreferent colors were similar to that of the referent, speakers used one of the less common (low-frequency) names to communicate the referent color.

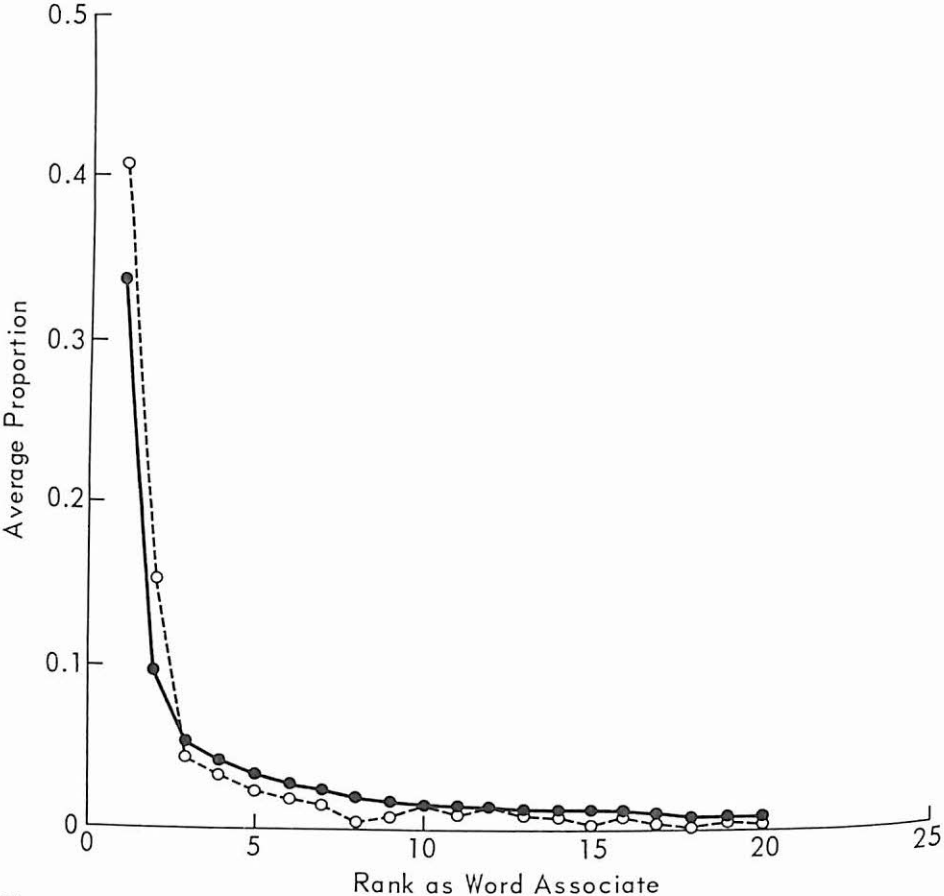

FIGURE 4.4 *The solid curve (• —— •) is the average rank-proportion distribution of responses (to ten stimulus words) obtained under free word association conditions. The broken curve (o- - -o) is the average rank-proportion curve for these same responses obtained from speakers whose task was to distinguish each of these stimulus words from an unrelated nonreferent. (From Rosenberg and Cohen, 1966.)*

In dissimilar stimulus arrays the agreement among speakers in the names they used to refer to a color was significantly higher.

The results shown in Figure 4.4 also support a fundamental proposition concerning the sampling stage, that is, that the probability that a word will be sampled by the speaker is monotonically related to its probability as a word associate. The data from synonym pairs also support this proposition although it is difficult, in the case of synonym pairs, to derive precisely the relationship between sampling probability and emission probability.

Extensions to Complex Behavior

Our studies support the main features of a two-stage speaker theory. The theory suggests a number of possible sources of poor speaker's responses:

1. The speaker may fail to sample an excellent speaker's response because its sampling probability is low. This is particularly likely to happen when subtle distinctions are required, as is the case with synonym pairs. There are in Table 4.1, for example, instances of effective speaker's responses available for each referent —responses which are undoubtedly in the repertoires of all the speakers. Nevertheless, some speakers gave poor responses.
2. Poor responses are not invariably filtered out in the comparison stage. The probabilistic nature of the comparison stage implies that a speaker will occasionally emit a response that he would reject as inadequate most of the time.
3. If the speaker is limited in the time he has available to respond, that is, if he can sample and compare only once or twice, he should give poorer responses. In ordinary conversation, social pressures often act to truncate the process of response selection. We cannot be silent for a minute and still hold the floor. Filling pauses, by lighting a pipe, for example, often serves to fill a break in the flow of speech where time is required for selecting a response. A speaker in ordinary conversation (and in our task) will sometimes fill a long pause with a comment about "searching for the right word," one that is on the "tip of my tongue."

There is some evidence from speech samples that long pauses and hesitations in speech are in part concerned with the selection of a name for the referent. Goldman-Eisler (1958, 1961) and others have found, for example, that hesitations in speech are closely related to the amount of information transmitted; that is, a long pause precedes words of low predictability. These findings and the interpretations usually given to them are consistent with the notion that a long pause may represent, in part, processes of labeling (sampling and comparison) and, in part, the organization of these "labels" into an acceptable grammatical structure.

The comparison stage may thus be likened to self-editing both in speech and in writing. Original drafts of a paper often provide an overt, albeit incomplete, record of self-editing. Speech also contains a number of indications of self-editing (in addition to long pauses) with comments such as, "I was tempted to say. . . ." Partial failures in self-editing are common, as for example, false starts, mumbling, and so on. There are linguistic conventions for retracting an utterance with remarks such as, "I meant to say. . . ."

A speaker may also supplement his self-editing by eliciting information from his listener concerning the adequacy of an emitted utterance. For example, the speaker may ask, "Is that clear?" or, "Do you know what I mean?" or he may simply pause to wait for a sign of understanding from his listener. The speaker's use of these conventions is most likely to occur when equally strong associations exist between the speaker's utterance and a variety of possible referents (only one of which is the speaker's actual referent). Analogous conventions are also available to a listener when the speaker's utterance is ambiguous, for example, "I don't understand," "Do you mean the *revised* edition?" or a blank look.

Not all self-editing is attributable solely to the speaker's problem of clearly distinguishing a referent from a stimulus array. There are motivational factors for withholding a response to a referent. This type of self-editing can also be faulty. Many interesting examples of such faulty self-editing, notably slips of the tongue, are discussed by Freud and by Skinner (1957, Chapters 15–16).

The comparison stage may also be viewed as one in which the speaker takes the role of the listener before emitting a response. This notion is reminiscent of Mead's concept of "taking the role of the generalized other." Mead comments, "We always assume that the symbol we use is one which will call out in the other person the same response, provided it is a part of his mechanism of conduct. A person who is saying something is saying to himself what he says to others; otherwise he doesn't know what he is talking about" (Mead, 1934, p. 147). Introspective observations (if the reader will pardon our occasional appeal to this quaint method) also suggest the proposition that the comparison stage serves to "socialize" our speech and writing. When we are "speaking" to ourselves only, language no longer conforms to the grammatical and semantic constraints that characterize overt speech. Sentences are often not completed, reference phrases are idiosyncratic, and the sequence of referent objects appears to be less orderly. Werner and Kaplan (1963, Chapters 17–19) provide experimental verifications of some of these differences between "inner" and "external" speech.

Mead also pointed out that the development of the generalized other in children proceeds from the "particular other." If this is so, we might expect that younger children would fail to give good speaker's responses precisely where the operation of the comparison stage is critical. The child who indiscriminately refers to his Betta with the name *Charlie* (the fish's pet name) exemplifies this defect. That is, *Charlie* might denote the referent to a parent (a particular other) but not to a stranger (a representative of the generalized other). Studies of children which bear on this question are discussed in the latter part of this chapter.

REFERENTIAL PROCESSES OF THE LISTENER

We postulate that the listener's identification of the referent is the result of a probabilistic process similar to that of the comparison stage of the speaker. The associative strength of the referent to the speaker's response, as compared with the associative strength of the nonreferent to the speaker's response, determines the probability with which a listener chooses a stimulus word as the referent. What is needed is a precise way of measuring associative strengths and a rule for combining the two values of associative strength to predict a listener's choice.[4]

Associative strength is measured from word association data. The proportion of subjects in the standard word association task who gave a particular speaker's response to a particular stimulus word is used to estimate the *associative probability* from that stimulus to that speaker's response. It is important to emphasize that word association data provide an *estimate* only. Associative probability is an idealized or hypothetical quantity. *Associative strength* is obtained from a power transformation of the estimated associative probability. An example of this type of transformation is shown in Figure 4.5. Note that when the associative probability is zero, associative strength is greater than zero. As we shall see, this feature of the transformation is necessary to account for listeners' choice behavior when the associative probability

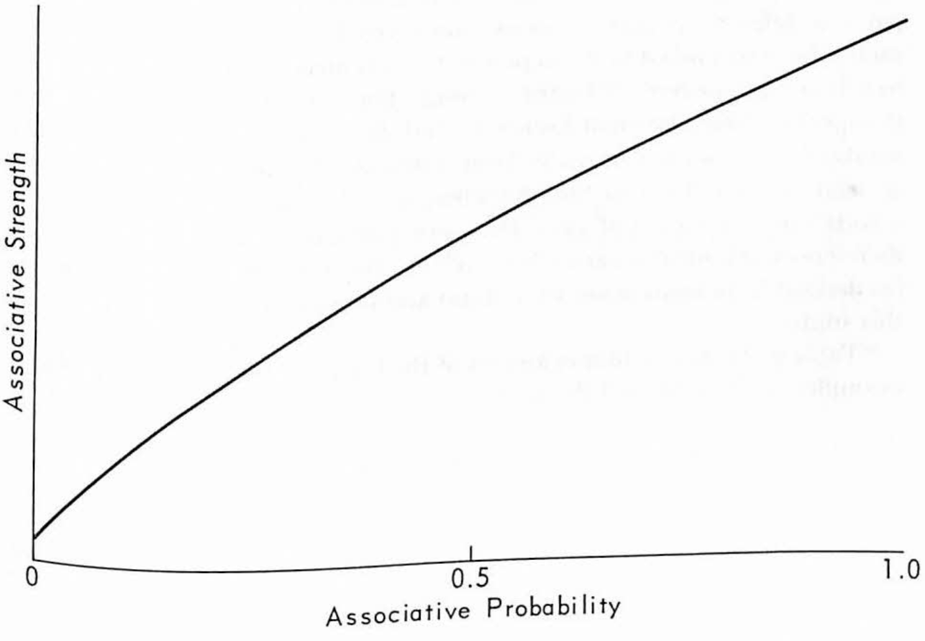

FIGURE 4.5 *Relationship between associative probability and associative strength.*

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[4] There are many situations (natural and experimental) in which listeners do not have an explicit stimulus array from which to pick a referent. In such instances it is likely that the listener's referential process includes a sampling stage in addition to the comparison stage. That is, in the absence of an explicit stimulus array, the listener may first sample several implicit representations (that is, symbols or images) of possible referent stimuli. He then makes his comparisons among these representations.

of the speaker's response to one of the stimulus words is zero, that is, when the speaker's response does not occur as a word associate to one of the stimuli.

Other transformations of associative probability such as the exponential and the linear have also been examined empirically and do not predict listener behavior as well as the power transformation shown in Figure 4.5.

Associative strength is used as follows to calculate the probability with which a listener chooses the referent. Let us assume, for example, that the associative strength of the speaker's response to the referent is x and to the nonreferent is y. The probability that the listener will choose the referent is $x/(x+y)$. This is known as the Bradley-Terry model for paired comparisons. This model was tested with actual listener data, which are reported in the next section.

Empirical Tests of the Listener Model

A detailed examination of the listener model was first made in the following experiment. A group of 110 male undergraduates was shown 256 synonym pairs; a different speaker's response was given for each synonym pair, and each subject was asked to try to pick out which member of the synonym pair had been the speaker's assigned referent. The subjects were also told that the speakers' responses had been collected during a previous semester. The speakers' responses had actually been systematically selected from the word association data of one or both members of each synonym pair. In this way a wide range of values of associative strength was obtained, and we could therefore examine rather carefully the relationship between associative strength (as derived from word association data) and listeners' choices as obtained in this study.

Table 4.2 contains four examples of the results of this experiment. These examples are typical and illustrate several interesting features of the data.

TABLE 4.2 *Examples of the Relationship between Word Association Data and Listener's Behavior*

Stimulus Array		Speaker's Clue Word	Proportion of Times Clue Word Occurred as a Word Associate to:		Proportion of Listeners Who Chose X as Referent
X	Y		X	Y	
CLUMSY	AWKWARD	*oaf*	0.140	0	0.964
PAIR	BOTH	*shoes*	0.107	0	0.945
CROOKED	BENT	*straight*	0.162	0.055	0.700
AUTOMOBILE	CAR	*crash*	0.007	0.007	0.520

In the first two examples, we see that even when the speaker's response occurs as a word associate to only one of the stimulus words, *X*, a small proportion of the listeners nevertheless choose the other stimulus, *Y*, as the referent. The proportion of listeners who do this varies systematically with the associative probability (or strength) of the speaker's response to the stimulus word, *X*. The topmost curve in Figure 4.6 (where the associative probability to *Y* equals zero) summarizes this relationship over a range of associative probabilities of the speaker's response to stimulus *X*. If we extrapolate the theoretical function which fits this topmost curve, the probability approaches one that a listener will choose the stimulus word having nonzero associative probability to the speaker's response. It is clear from these data why associative strength must be assumed to be greater than zero when associative probability is zero. That is, according to the rule for combining associative strengths $(x/(x+y))$, if y were zero and x were any value larger than zero, all listeners would choose *X* as the referent. The data in Figure 4.6 clearly do not support such a prediction.

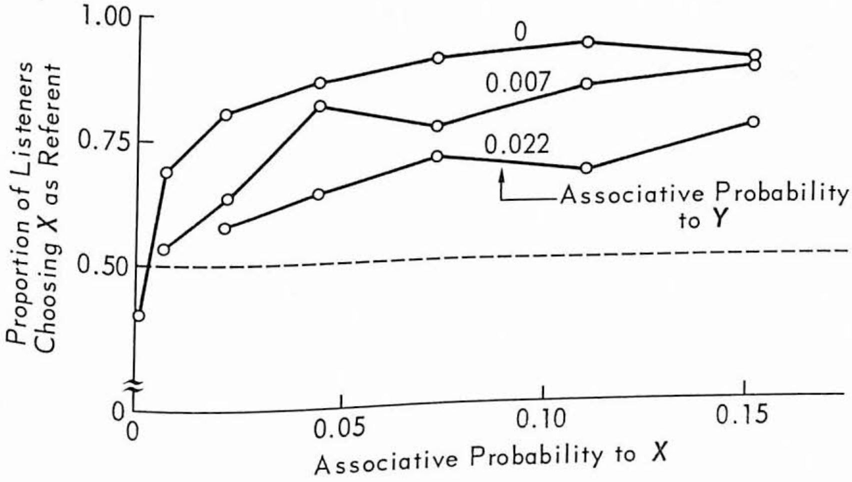

FIGURE 4.6 *The relation between data on word association (associative probabilities to* X *and to* Y*) and data on listener's choice.*

Going back to Table 4.2, we also see that the simple algebraic difference between associative probabilities does not necessarily provide an accurate estimate of the proportion of listeners' choices. The difference between 0.107 and 0 (for BOTH-PAIR, *shoes*) and between 0.162 and 0.055 (for BENT-CROOKED, *straight*) is the same. Yet the proportion of listeners choosing the stimulus word with the higher associative probability is 0.945 in the first case and 0.700 in the second case. This finding parallels that of Weber's law for physical continua. In order for a person to detect a difference between two weights, for example, the difference must be larger as the pair of weights is heavier.

The final example (CAR-AUTOMOBILE, *crash*) in Table 4.2 is what one might expect when associative probabilities (or strengths) are equal. The listeners' choices are split fifty-fifty (except for sampling error) between the two stimuli.

The relationships between associative probability and listener's choice are also summarized in Figure 4.6 for pairs of associative probabilities that are both greater than zero. We have shown elsewhere (Rosenberg and Cohen, 1964) that the Bradley-Terry model for paired comparisons provides a good fit for these data when associative strength is obtained from associative probability according to the relationship shown in Figure 4.5.

Listeners' choices are also predictable without use of estimates of associative strength from word association data. Consider a situation in which listeners are given three stimuli and a speaker's response. When any two of these stimuli are presented with the same speaker's response, we can predict the proportion of listeners who will choose one of them according to data obtained from the three-stimulus array. For example, consider the stimulus words LIBERTY, LAWFUL, and FREEDOM presented with the speaker's response *equality*. When this array was presented to 235 listeners (male undergraduates), 53.8 percent of the listeners chose LIBERTY as the referent, 10.3 percent chose LAWFUL, and 35.9 percent chose FREEDOM. According to the constant ratio rule (Luce, 1959), if only LIBERTY and LAWFUL are presented with *equality* as the speaker's response, the proportion of listeners choosing LIBERTY as the referent is predicted to be $[0.538/(0.538 + 0.103)] \cong 0.839$. The empirical result was actually 0.834. The result is typical of that obtained from forty-eight different sets of three stimuli and a clue word (Rosenberg and Cohen, 1966).

It should be noted again that word association data are not required in establishing this relationship. Thus, it is possible to extend this form of the listener model to nonverbal stimulus arrays and to speaker's responses consisting of phrases, sentences, and even nonverbal communications. Preliminary work along these lines has been started.

REFERENTIAL SKILLS IN CHILDREN

In terms of the present theory of referential behavior, the speaker in early childhood might be said to differ from mature speakers in at least two important ways: (*a*) his repertoire of names for any given referent is small; and (*b*) his speaker's response selection is less influenced by a comparison stage.

How does he manage, therefore, to communicate well enough to make his needs known? In the relatively circumscribed milieu of most children, the fact that the same name might refer to a large number of different referents may be of little consequence to a child's being understood. For example, if the child uses *kitty* to refer to tigers, it is unlikely that he will be misunderstood because tigers and domestic cats are rarely found in the same stimulus array. Or, to return to our earlier example, the child may use the name *fish* to refer exclusively to the pet Betta. So long as his conversation about it includes no one but himself and possibly his mother, no miscommunication will occur.

In time, however, the child may begin to use *fish* to refer to other fish, as well as to snails and other tank-related objects. This could mislead a listener to buy the child a Betta when he wants a snail. The listener, if he is aware of the child's referential habits and the situational context, can usually discover the actual referent (the snail) after it becomes evident that the child's referent was not the Betta on this occasion. At such times, the adult may correct the child's language and attempt to teach him to say *snail* for snails, and restrict *fish* to fish. Thus, the child begins to develop more specialized referent-response repertoires.

If the process goes only this far, the child will remain dependent on the adults who have shaped the repertoires from which he samples his speaker's responses. *This process, however, does not provide him with the means to distinguish, for any listener, referents in novel combinations of stimuli where the nonreferents may be called by names similar to the referent.* In normal development a comparison stage is developed that permits the child to filter out, implicitly, ineffective utterances and to emit those that are more likely to evoke the desired response in his listeners. How might this skill be acquired?

One possibility is that the child acquires this skill by observing the mature speakers in his social milieu and modeling his speaker's comparison behavior after theirs. So direct an acquisition route might be shown to hold for aspects of language that are directly observable, like pronunciation, articulation, and the simple pairing of names and things; but modeling seems less efficient for the acquisition of speaker's comparison skills because the skills are largely inaccessible to direct observation. Those features of speaker-comparison that are sometimes peripherally observable, like the nonfluencies and the forms of overt self-editing mentioned earlier in this chapter, are probably much too subtle and transient to serve as an adequate basis for learning by observation and imitation.

An alternative possibility is that the child first acquires *listener's comparison* skills, which then provide the basis for development of comparison skills in the speaker's role. This process can be illustrated by situations in which the same name can refer to several objects, each with a different probability of being the referent of that name. For example, the name *candy,* on a given occasion, might refer to a piece of chocolate or to a girl neighbor, but the chocolate has the higher probability. On being asked to "get candy from the kitchen," however, the child might return with the somewhat bewildered girl neighbor (perhaps protesting that she wasn't in the kitchen). On such occasions, the child's misinterpretation will be corrected by the adult. The child will learn, in time, to make this corrective feedback for himself before choosing the referent. That is, the child will begin to make listener's comparisons between referent and nonreferent stimuli on the basis of the speaker's response of another person. Finally, speaker's comparison skills are acquired when the child transfers to his own utterances the comparison behavior he has previously learned in relation to the utterances of other speakers.

The child's early experience in listener's comparison is likely to be related to a narrowly circumscribed group of speakers, topics, and circumstances, like those of his immediate home setting. This will tend to limit the nature and variety of utterances, speakers' habits, and referent stimuli to which he responds as listener. A further narrowing factor is that the speakers (say older sibs, parents, or institutional attendants) will frequently edit their utterances in order to place the minimum demands on the listener's comparison capacity of the child. The speaker's responses used will tend to be those the speaker considers appropriate for the child, even if they have no currency outside the child's own home setting. On the basis of his limited initial listener experiences, the earliest behavior of the child as a speaker will be less effective with strangers than with listeners who live in close daily contact with him and will possibly be most effective when he is his own listener—when he is talking to himself.

An illustration of the limited audience with which the young child can communicate is provided by the results of an experiment reported by Krauss and Glucksberg (1965). Their test situation is shown in Figure 4.7. One member of a pair of children was given the task of providing speaker's responses ("reference phrases") that would indicate to his partner the order in which a set of blocks was to be stacked. Speaker and listener were separated by a screen. Each of the speaker's blocks was stamped with a different novel form; the listener's blocks were a duplicate of the speaker's.

These investigators found that preschool children, between four and five years of age, were unable to produce adequate speaker's responses in this situation. It was noted that speakers were generally consistent in using particular reference phrases to designate given forms, but their listeners were unable to make consistent or correct matches on the basis of these phrases. However, in a subsequent study, when the child speakers were assigned the listener role and given their *own* reference phrases as speaker's responses, they were able to make highly consistent and correct matches.

These findings might be attributed to faulty speaker's comparison, in the sense that the children failed to take into account the comprehension repertoires of their listeners when editing their own sampled responses. According to Piaget (1926) such communication represents "egocentric" in contrast to "socialized" speech. Similarly, Werner and Kaplan (1963) proposed that with increasing maturity "the differentiation between speech for the self and speech for others becomes progressively more marked" (p. 328).

An alternative possibility is that much of what has been called egocentric

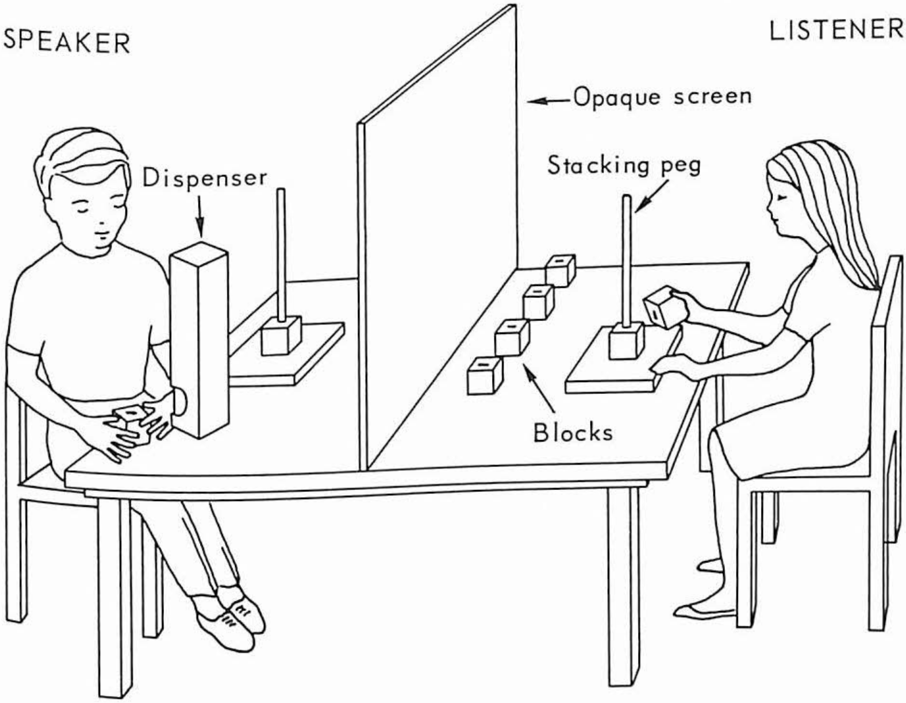

FIGURE 4.7 *The test situation devised by Krauss and Glucksberg for studying communication between children. (From Krauss and Glucksberg, 1965.)*

speech, and considered to reflect the failure of the child to edit his responses for his listener, might actually be due to deficits in the repertoires from which children sample. A noncommunicative speaker's response can result from the fact that the child simply doesn't yet have the responses that would be adequate for the listener in a given situation.

In a recently completed experiment, children from the third, fifth, and seventh grades of a local school system were given the two-person word communication task described earlier in this chapter.[5] There were forty children at each grade level, half boys and half girls. The children worked in pairs consisting of a speaker and listener of the same grade and sex. Thirty pairs of stimulus words were used; they were related pairs (like WRITE-PRINT, GLASS-CUP) predominantly chosen from words rated high in frequency (A or AA) by Thorndike and Lorge (1944). The main findings were:

1. Accuracy of communication (proportion of correct referent identi-

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[5] The data were collected by Mrs. Judith Klein.

fications) increased significantly as a function of grade level, but was unrelated to sex.

2. No differences were found among the distributions of speaker's responses of the three grade levels in the number of (*a*) "popular" responses, (*b*) "unique" responses, or (*c*) different speaker's responses (clue word types per stimulus pair).
3. Although the distributions of speakers' responses in the three grades were similar in form, they were different in content. That is, significant differences among grade levels were found in the frequencies with which particular clue words were used.
4. The difference in communication accuracy between the youngest and oldest groups was reduced when the analysis was limited to instances in which listeners in these two groups were given the *same* clue words. When third-grade speakers used clue words that were more commonly used by seventh-grade speakers, the accuracy of the third-grade listeners approximated the level achieved by seventh-grade listeners. Also, when seventh-grade speakers used clue words that were more commonly used by third-grade speakers, the seventh-grade listeners' accuracy dropped to the level of the third-grade listeners. In sum, when speakers' responses were held constant, differences in listeners' accuracy between the oldest and youngest groups were reduced.

We cannot rule out faulty speaker's comparison as a source of the relatively poor performance of the third-grade speakers. An explanation in terms of *egocentric* speaker's comparison, however, is weakened by the fact that the youngest speakers in the present study did not produce larger numbers of unique responses or response types than speakers in the older groups. That is, if each third-grade speaker was emitting responses that would be adequate for himself, but not for other listeners, we would expect the third-graders to have used a larger number of unique speaker's responses than the older speakers.

An alternative explanation of the developmental changes in communication accuracy can be formulated in terms of age-related increments in the sets from which the older speakers sample. This possibility is attractive in view of (*a*) the continuing development towards more adult-like word association repertoires as children proceed from the third to the seventh grade (Palermo, 1963) and (*b*) the fact that vocabulary sizes are still increasing through this age range. If this is the case, however, how can we account for the finding that the third-grade listeners performed as well as the seventh-grade listeners when they were responding to clue words commonly produced by seventh-grade speakers but rare for third-grade speakers? Apparently the third-graders "knew" the normative associative strengths of these clue words well enough to make as accurate comparisons as the seventh-graders in the listener role. There seem to be many associations to the referent that a young child can readily "recognize" if the responses are sampled for him by another person, even though the associative probabilities for these responses may be too low for the child to be likely to sample them as a speaker. This accords with the common observation that children's comprehension vocabularies develop more rapidly than their vocabularies of expression.

It is clear that a systematic experimental program is needed if we are to pin down more decisively the relative roles played, at various age levels, by comparison stage variables and by the nature of the repertoires from which children sample responses. It is possible, for example, that egocentric speaker's comparison is an important determinant of communication in preschool children, but no longer applies at later childhood levels where the major continuing changes may be attributed to further elaboration of speakers' sampling repertoires.

We realize that there are many more component skills in human communication beyond those we have discussed in this chapter. We have limited our discussion to those skills most relevant to our current research. This research has helped us to formulate meaningful questions concerning referential processes in adults and children. It is hoped that the methods and concepts described will make it possible to answer these questions and ultimately to provide novel approaches to the analysis of communication pathology.

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CHAPTER 5

THE RELEVANCE OF ANIMAL RESEARCH

Jack Michael

For several reasons, it is important to begin this chapter with some disclaimers. It would be a serious mistake to view the retarded human as in some way more similar to a lower animal than the normal human is and to develop an interest in animal research for this reason. Such an approach is the result of a very superficial analysis of the behavior of the mental retardate. Neither does the major contribution of work with lower animals derive from the fact that we can, without serious moral qualms, provide lower animals with artificial brain damage and study the effects of such damage on their behavior, although this is not an unprofitable line of inquiry. And, finally, we cannot expect much help in efforts to understand language and language difficulties in the retarded from attempts to provide some form of language to lower animals or to study naturally existing behavior that resembles human language, although, again, such investigations are not without significance.

The main value of animal research is more indirect. Twenty years of intensive work with lower animals, primarily rats and pigeons, has resulted in a rich assortment of techniques, concepts, and principles whose relevance extends to the behavior of all organisms. Much of the technology of the animal laboratory can be applied almost without modification to the problems of research in mental retardation, and the principles of behavior that have developed in such laboratories are being put to work increasingly to explain mental retardation and to remedy it. As illustrative of this general approach, I should like to consider three points of contact between the area of animal research and mental retardation. The first concerns the relative ease or difficulty of different kinds of behavior, the second concerns motivation and reinforcement variables, and the third is a report of some new discoveries in the area of stimulus control.

EVALUATION OF BEHAVIORAL ACCOMPLISHMENTS

My first contact with mentally retarded children was on a research project in which Lee Meyerson and I collaborated in the development of an operant conditioning technique for testing auditory sensitivity (1963). The procedure that proved most effective was one in which the subject sat before a panel containing two levers, above each of which was a light. The auditory stimulus was sounded either through headphones or through a loudspeaker in the ceiling. The subject first learned to operate the lever on his right and was reinforced intermittently by the delivery of trinkets, candy, and the like into an open pan located between the two levers. The schedule of reinforcement was variable ratio 8. During the time the child was learning to operate the lever on his right, a loud tone was played through the sound system and the light above the right lever was on. Eventually, the tone was silenced, the light above the right lever was turned off, and the light above the left lever was turned on. At this time, pulling the left lever paid off on the same variable ratio schedule that had prevailed on the right lever. Responses on the right lever were now not reinforced at all. These two conditions were then alternated. The children quickly learned to follow the light, that is, to operate the lever beneath the illuminated light. If the subject could hear, the tone provided an additional cue for correct responding. If the tone was on, the child could receive reinforcement for operating the right lever. If it was off, operation of the left lever was reinforced. The equipment was programed so that simultaneous operation of the levers and rapid alternation between the two levers were never reinforced. After the child learned to follow the light, it was gradually faded out, leaving only the tone to control responding. The tone was then attenuated gradually, and an evaluation of auditory sensitivity was thus provided. Two to five half-hour sessions were usually sufficient to provide sensitivity measurements for a series of eight tones.

When I first described this procedure to interested parents, teachers, and specialists in the field of retardation, I encountered what at that time struck me as a curious misunderstanding. We were using as subjects a heterogeneous group of trainable retardates ranging in age from seven to nineteen years. In general, the adults who had contact with these children were confident that the children could *not* perform the task. The most frequent comment was, "He will not be able to understand what you want him to do." To those of us who work with lower animals, this pessimism seemed completely unwarranted. The procedure we used was a modification of a relatively common technique for studying stimulus control in rats and pigeons. Most of these children had some speech, dressed themselves, and followed verbal and gestural directions—all of which are as complex as the two-lever discrimination of our audiometric testing situation.

Since that time I have frequently encountered variations of the same misunderstanding. A very common example is the belief that various kinds of intermittent reinforcement will "confuse" the mentally retarded subject and that, as a result of the confusion, he will be unable to respond. Another is the notion that even simple forms of vocal behavior, such as naming objects, require some very special higher intellectual ability not found in lower animals and likely to be deficient in the retarded.

The basis of this misunderstanding seems to involve the assumption that most learning takes place by processes requiring an ability to verbalize the requirements of the learning situation or to profit from verbal instructions. If this were true, of course, nonverbal organisms would learn very little; and, in fact, many laymen hold the erroneous view that most of the behavior seen in such organisms is instinctive.

Unfortunately, it is not only the layman who has trouble evaluating the relative difficulty of different kinds of behavior. Educators, psychiatrists, neurophysiologists, and even psychologists whose special interest is human learning often find this an impossible task.

A familiarity with current developments in lower animal research will not by any means solve the problem; but it should, at least, prevent gross errors since it is in this area that the problem of building behavior from very simple components is directly dealt with. In much human research on learning, the subject's repertory at the start of the experiment contains many components which contribute in unknown but considerable degree to the experimental task. And, if the experiment lasts over several days, the activity engaged in outside of the experimental setting contributes a further unknown factor, often not of minor significance. Said another way, when a psychologist develops a complex form of behavior in a human subject, his explanation of how he did it could be quite wrong in spite of the fact that the behavior was, indeed, produced. This is less true in the case of an animal subject, and as a result the explanation given by the experimenter should be more valuable to us.

To return for a moment to the evaluation of the relative difficulty of language behavior, there is a fairly common kind of deficit which seems especially amenable to more intensive training efforts. Some children make a wide variety of sounds, but do not use these sounds as a form of functional language. There is no behavioral reason why such sounds cannot be made functional rather quickly if the environment is such that important events are contingent on the occurrence of those sounds. This is just ordinary operant behavior, no different in underlying behavioral principles from other operants such as reaching for things, walking, operating door knobs, and the like. Furthermore, making several different sounds under the control of different stimuli is identical in principle with making different motor responses of a nonvocal form in the presence of different stimuli, such as operating one kind of door knob with one motion and a different kind with a different motion.

If the speech musculature or the relevant motor region of the brain is damaged, then vocal behavior may be uncontrollable. However, this possibility should not prevent the development of normal verbal behavior (in Skinner's sense) based on some means other than the voice. This could be a form of gesture or sign language, but better yet, it could be a mechanical device which would make speech sounds and could be operated with the hands. The engineering problems could probably be solved rather easily for the price of a jet plane or two. A beach ball device which emitted squeaks and moans and various sounds when squeezed in various ways would suffice. It might take years to be worked effectively, but so does our vocal musculature. The advantage of this kind of substitute for ordinary speech is that the user could produce a stimulus which ordinary listeners could react to. Special training in sign language or some sort of code would not be required.

In summary, then, one major value of animal research findings and methods to those concerned with language learning in the mentally retarded is to provide a basis for the analysis of behavior into its components and for the assessment of the difficulty of these different components.

IMPORTANCE OF REINFORCEMENT VARIABLES

In animal research which results in the production of complex behavior, the subject is usually placed on a regimen of systematic food deprivation and given small amounts of food as a reinforcer. During training he is kept in an enclosure which reduces the effect of uncontrolled outside stimulation. The enclosure contains the feeder mechanism, the response apparatus, devices for presenting stimuli, and little else. Programing of stimuli and reinforcement contingencies is accomplished automatically by electronic equipment since human programmers lack sufficient patience, accuracy, and speed for the task.

These procedures are in striking contrast to those used in remedial and research work involving the mentally retarded. Fortunately, the automatic control that can be used in mental retardation is primarily a matter of engineering developments and sufficient financial resources. An increasing number of research establishments use such methods.

A much more difficult problem is the discovery or development of an effective reinforcer. The reinforcers usually available to the mentally retarded learner are social approval, advancement in some series of learning tasks, candy or similar nonessential edibles, trinkets and toys of various kinds, and escape from or avoidance of mild social disapproval or other aversiveness. The reinforcing effectiveness of these events for a particular child is often not known and in any case varies from moment to moment. Furthermore, these are not the kind of events which will maintain intense work for a number of hours a day for many days, and intensive work may well be what is required to overcome some deficiencies. Until this problem of effective long-term reinforcement is solved, the true potential for recovery from mental retardation cannot be evaluated.

In the case of institutionalized children whose mental age is three years or more, a possible solution is a comprehensive, token reinforcer system. This is a system in which as many of the institution's reinforcers as possible are obtainable only through the exchange of tokens, which in turn are obtainable only as reinforcement of behavior that the institution wishes to develop or maintain. The tokens could take a variety of forms, providing only that the child be able to retain some record of his "wealth" so that he can observe progress toward various goals. Coins and paper money, such as the tokens of our own adult world, are not the most convenient form since they can be lost or stolen. A card which the institutional representative can mark or punch holes in or a booklet in which stamps of some sort can be pasted is a safer form of token.

Tokens are already used in many educational settings; but most often they are related to fringe benefits such as a special prize which only one child can win, or they are symbols of educational accomplishment not redeemable for anything other than social approval. Such fringe benefits are no more durable or generally effective than the reinforcers already available and would not be expected to maintain prolonged and effortful remedial work.

The value of the ordinary adult token—money—is due to its relative independence of momentary conditions of deprivation or aversive stimulation. It functions as a reinforcer in maintaining long hours of productive work because it is exchangeable for many different kinds of positive reinforcers and purchases escape from, or avoidance of, a wide variety of aversive conditions. It is seldom the case that none of these motivating conditions are in force.

To produce a comparable token for the institutionalized retardate, it will be necessary to set up a culture in which most of the good things in life are purchased with tokens, and many of life's inconveniences are avoided or escaped by payment of tokens. For example, special foods, desserts, entertainment in the form of movies, trips, participation in games, special toys, trinkets, more comfortable living conditions, and special kinds of attention from adults should all be available for a price. Also various inconveniences, such as being required to move from a familiar living condition to an unfamiliar one, being required to wait for certain kinds of reinforcers, and so on, should be avoidable by payment of tokens. In such a culture, tokens would become powerful reinforcers and could be used to maintain long periods of intense educational activity.

The most common objection to this kind of suggestion is an emotional and moralistic one. Isn't it inhumane to make such demands of individuals who are handicapped when we do not make them of normal children? Children should be out playing, having fun, and to withhold something from a child that he wants badly until he engages in some educational activity is cruel.

The next most common objection is that it won't work because to function well in a monetary culture requires a certain amount of intelligence and years of training, and even normal children do not become effective with money—do not "learn the value of money"—until they are practically adults.

A detailed answer to the belief that deliberate programing of most of the child's reinforcement contingencies is in some way immoral would take us too far afield. However, it may help to point out that what I am *not* suggesting is the establishment of harsh contingencies which the subjects must meet or else do without reinforcements. In an effective token culture, it would be considered highly undesirable for anyone to fail to receive a great deal of reinforcement. A child who is not receiving a heavy dose of reinforcement is a child who is not learning anything, a situation calling for immediate relaxation of requirements followed by a more gradual advancement.

The fact that normal children do not acquire effective behavior regarding money until they are fairly mature is not as relevant as the fact that chimpanzees do acquire a rudimentary form of token behavior when they receive special training. The only token that most children are exposed to is ordinary money, but because it is not usually convenient for parents to involve young children in an adult token system, most children receive very little early or intensive training with tokens. However, there are enough cases of parents who have developed special token systems for their children (usually to maintain cleanliness and order) and special institutional environments where tokens are used to assure us that such a plan is feasible.

Even suggestions that do not bear directly on the idea of a token culture, if they propose more prolonged and intense training for the mentally retarded, often meet with the notion that the attention span of these subjects is limited. This is a concept usually brought in after the fact to explain a failure to maintain behavior. It has no parallel in lower animal research. Any failure on the part of a lower animal to maintain some activity for as long as the experimenter desires is considered an example of lack of control over the relevant variables. Most instances of short attention span in the mentally retarded that I have observed stem from weak reinforcement of the desired activity combined with reinforcement of other activities. There is no reason to suppose that the mentally retarded will show a degree of persistence in reinforced behavior less than that of rats, pigeons, and normal humans for that matter.

While an institutional culture based on a comprehensive token system of reinforcement may facilitate prolonged remedial educational work in some retarded individuals, there are surely some for whom such a system is not possible. These are the children whose only reinforcers are those related to relatively primitive reinforcer-deprivation systems based on essentials like food and water and on aversive conditions such as excesses in temperature or painful stimuli.

Because the behavior of these children seems so unamenable to the ordinary instructional methods, which rely heavily on verbal behavior, custodial care alone is usually given. Behavioral potential in such cases cannot be fully appraised until we are able to provide intensive remedial training at a very early age, and this will wait upon our willingness to utilize primitive deprivation-reinforcer variables within the remedial setting. Although it may seem harsh to require a severely retarded child to obtain all of his food as reinforcement of successive approximation to a verbal repertory, for instance, it could just as well be argued that it is harsh to waste his critical early years. With an effective reinforcer, aid from the field of automation and electrical engineering, and sound reinforcement principles, there is no question that a great deal more could be accomplished with these children.

One final objection to creating well-controlled environments is that although it may be possible to develop the kind of behavior we want in our well-controlled setting, the child must ultimately function in the poorly controlled everyday human social situation. The answer is that the well-controlled setting may be necessary for the development of a repertory, but once a repertory is developed, it will function in the same way that similar behaviors function in normal individuals. It is hard to believe that a child who has learned to control his social environment through verbal behavior and is reinforced for doing so will discontinue this behavior in favor of more effortful forms of control. To the extent that a behavior developed in the remedial setting continues to be reinforced outside this setting, we would certainly expect that behavior to be maintained; and it is our task to be sure that the kind of behavior developed in the remedial setting is exactly that kind which will function well in the outside social environment.

In summary, then, for remediation of many kinds of retardation, it would appear that thousands of hours of intense, effortful, educational activity are required. To say the least, we cannot know how much remediation is possible until we push the time and effectiveness of training to the maximum. To do this, an effective reinforcer is absolutely essential. A comprehensive token culture will provide such a reinforcer for some retardates; for others the only solution may be to use the same biological variables that are used in experiments with lower animals. To anyone who has worked with lower animals, the present accomplishments with the retardate seem remarkable indeed, considering the lack of control over the relevant variables. When good control is provided, there seems to be good reason for an enthusiastic optimism.

DEVELOPMENT OF STIMULUS CONTROL

In the preceding section the maintaining or motivating function of reinforcement was emphasized. But now that we have our subjects putting in a six- to twelve-hour day on educational activity, is there any animal research suggesting improvements in the nature of such activity? There are a number of recent findings which seem to me of considerable significance, but the work which bears most directly on the problems of language learning in the retarded is that of H. S. Terrace on errorless discrimination learning (1963*a*).

Operant responses have traditionally been brought under stimulus control by some variation of the following training procedure. First, the response is shaped and a number of reinforcements are given in the presence of the positive stimulus. For example, a food-deprived pigeon is reinforced with a few seconds' access to grain for successive approximations to pecking a transluscent disk (or key) on the wall of his chamber. The key is illuminated from behind with a green light. After he has learned to peck the key and has been reinforced a number of times for this response, the color is changed to red. While the key is red, no responses are reinforced. However, the bird responds in this condition almost as readily as in the positive stimulus condition. After the negative stimulus, or S–, has been present for awhile, the S+ is presented again, and the pecking response is again reinforced. These two stimulus conditions alternate, but the S– is usually present for a considerably longer time than the S+ because it is said that little training is needed to maintain a strong response in S+ but much unreinforced responding has to occur in the S–. Eventually good stimulus control develops in the sense that very few responses occur when the key is red, but when it becomes green, the bird pecks it immediately.

The relevance of this to language learning is quite clear. As Skinner (1957) has suggested, the vocal behavior of human speakers is essentially operant behavior under stimulus control, but an especially close parallel to the pigeon experiment described above can be seen in a child's acquisition of vocal responses controlled by features of the environment—the "tact," in Skinner's terminology. The child's vocal response "red" is brought under the control of the relevant feature of the environment in much the same way that a pigeon would be taught to peck red keys but not keys of other colors. Of course, the well-developed abstraction would require that other features of the keys, such as their shape and location, become irrelevant, but this is a relatively straightforward extension of the discrimination procedure.

As was indicated above, in the standard discrimination procedure there is a good deal of what could be called erroneous responding, that is, continuing to respond when the S– is present. For difficult discriminations, several hours of extinction are required to reduce this behavior to the point where only one tenth as many responses occur in S– as in S+. Prior to the work of Terrace, these errors were thought to be a critical part of the discrimination process. What he has shown is that excellent discriminations can be developed quite quickly with no errors and, further, that these errorless discriminations show important emotional differences from discriminations developed in the ordinary way.

First, I will describe the techniques of errorless discrimination training in the context of the previous example. There are several features of the procedure which distinguish it from the standard procedure. In the first place, the S– is introduced very early in training, usually after only a few reinforced responses in the presence of the S+. Second, S– is at first made to differ from S+ as much as possible. This means that other dimensions of the stimulus than the one on which the discrimination will ultimately be based are changed. In the example of the pigeon learning to peck the key when it is green but not when it is red, Terrace would introduce the S– as a completely dark key, thus differing in brightness as well as color from the S+. Additional irrelevant stimuli could be added, such as a buzzer sound during the S– but not during the S+. The result of this aspect of the procedure is that the stimulus change from S+ to S– is so dramatic that the tendency to respond in the presence of S– is at first quite low. Third, the S– is presented only briefly at first. This is exactly opposite to the standard procedure. The final feature is the gradual elimination of the irrelevant stimulus differences and the gradual increase in duration of S–.

As a result of these procedures, responses simply are not made to S–. In the present example, the completely dark key is slightly lighter and greener at each presentation and remains present for longer and longer periods. Eventually it is bright green and remains present as long as S+, the bright red key, as they are presented alternately.

As Terrace shows in a later paper (1963*b*), the same procedures can be used to transfer from an easy discrimination, such as the present one, to a more difficult discrimination, such as that involving a key with a vertical line on it and an identical key with a horizontal line on it. The red-green control is first developed; then the vertical and horizontal lines are gradually faded onto the green and red keys respectively; then the colors are gradually faded off, leaving an errorless performance under the control of the more difficult stimuli.

When the performance of a bird that has developed good discriminative behavior by the errorless method is compared with good discriminative behavior developed in the traditional manner (with numerous errors and considerable extinction responding), an important difference is noted. When S– is presented, the birds receiving ordinary training "would usually flap their wings, stamp on the floor of the chamber, and orient themselves away from the key." Those trained with the errorless procedure simply "lowered themselves away from the key and stood quietly facing it until the next S+ appeared" (Terrace, 1963*a*, p. 13). It would appear that as a result of unreinforced errors in the presence of S–, this stimulus acquires aversive properties. This interpretation was further strengthened by an experiment using tranquilizing drugs (Terrace, 1963*c*). It had previously been noted that chlorpromazine and imipramine disrupted visual discriminative performances of pigeons. This disruption could not be attributed to the sedative effects of the drugs since it occurred at considerably lower dosage levels than is required to produce noticeable sedative effects. Terrace was able to show that when the discrimination was developed by the errorless method, no disruption occurred. The obvious interpretation is that in ordinary discrimination learning it is partly the aversive aspects of S– which determine the performance and that, when the control of aversive stimuli is reduced by drugs (and we can presume by other means as well), the discrimination is not maintained.

These experiments have several implications for language learning, but the most important concerns the use of irrelevant stimuli and the prevention of errors. Extensive use can be made of irrelevant stimuli to make discrimination as easy as possible, but the irrelevant stimuli should be the kind that can be *gradually* removed. For example, in learning color names the critical stimuli could differ with respect to brightness, location in the room, size, and shape. All of these can be faded away gradually. Order of presentation, however, should not be used since it cannot be gradually eliminated. Every effort should be made to avoid erroneous responding. The development of erroneous behavior is an indication that the stimulus change has been too rapid.

It would be well, in this connection, to point out a similar possibility with respect to motor skill acquisition. In the teaching of complex motor skills, one can design an environment which accommodates the learner's initial undeveloped repertory and which can be gradually faded into the final environment. The learner would not need to make any errors and could be reinforced throughout the entire learning procedure. For example, it would certainly not tax the ingenuity of our mechanical engineers and designers to develop a sequence of shoestring-tying apparatus that started with gross positioning movements and progressed in very gradual steps to the final task. Likewise, a series of apparatus starting with a slightly raised portion of the floor and progressing into a set of steps and finally into a tall ladder could be easily designed. The successful exploitation of these techniques is primarily a matter of designing an effective learning environment and making use of standard electrical and mechanical engineering methods.

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CHAPTER 6

THE DEVELOPMENT OF COMMUNICATION SKILLS

R. L. Schiefelbusch

In studying language development, we usually find it necessary to indicate successive stages of early functioning. However, since children differ in their patterns of growth, these stages or levels can be traced only in broad outline. If the child passes from stage to stage in a manner similar to the hypothetically normal schedule, he is regarded as a normal child. The normal child, however, should not be expected to maintain a predictable schedule in all phases of his speech development. He may be ahead at some stages and show a lag at others.

Even with the allowances for broad variations among children, however, there are youngsters who show such marked deviations from the anticipated stages that they are regarded as speech retarded. Sometimes we refer to these children as having delayed speech or delayed speech and language. Usually the child's deficient behaviors are not perceived as defective until he is three or four years of age. This does not mean, of course, that the deficient functioning really had its incipient phase at this time. In all likelihood certain aspects of the speech deviation are derived from experiences which date from infancy. This means that children who are eventually to be diagnosed as defective in speech may have failed to acquire some of the antecedent skills for normal speech during the early months of life. The reasons for this distortion or delay are often obscure. Among the reasons usually advanced are: (*a*) low intelligence, (*b*) brain injury, (*c*) bilingualism, (*d*) twin association, (*e*) physical disorder, (*f*) sensory disorder, (*g*) ill health, and (*h*) emotional disturbance. Any of these or any combination of them apparently can affect the child's development during the early learning phases.

Unfortunately, these listings do not indicate much about the process of language acquisition nor about the environmental factors which may influence language development. Likewise they do not indicate how a child develops communication behaviors which enable him to relate effectively to other people. It is the intention in this chapter to focus upon the functional processes of language and communication, especially during four critical developmental stages, in order to suggest ways in which the process of acquisition may break down and ways in which it may be stimulated. In order to facilitate this discussion, I would like to relabel the phases of language development. In place of the conventional listings of *reflexive crying, babbling, echolalia,* and *true speech,* I would like to list the following four stages: (a) *sensory stimulation and smiling,* (b) *attachment,* (c) *word acquisition and social exploration,* and (d) *language acquisition and experience.*

SENSORY STIMULATION AND SMILING

In the early days of life the newborn makes seemingly random movements to which adults react with little expectation of a returned response. Recent evidence, however, suggests that the newborn infant has a variety of adaptive functions. He can discriminate forms in the early days of life and prefers to look at increasingly complex and interesting stimuli (Fantz, 1963). The very young infant spends much of his waking moments regarding people and things. The newborn also demonstrates ability to learn to turn in the appropriate direction to be fed when held by its mother, but it is not until the appearance of the smile that adults become acutely aware that the child is responding directly to them. Studies of behavior acquisition generally show that smiling does not usually occur much before the age of one month (Ambrose, 1961). Thereafter developmental trends are notable both in the increase of the smiling response and in the nature of the stimuli which are required to elicit smiling. Smiling increases in frequency up to about the age of six months (Spitz, 1946; Ambrose, 1961).

Rheingold (1961) in her studies of three-month-old infants has become impressed with their "alert, attentive, active, and responsive behavior." She says that already at three months, there has developed a responsiveness to stimuli in the environment and a searching of the environment for stimulation.

Rheingold *et al.* (1959) have successfully demonstrated the conditioning of vocalizations in three-month-old infants by using the adult social response as a reinforcer. Noting that infants characteristically vocalize as part of the total response they give an adult, these workers counted vocalizations for nine three-minute periods distributed through the day for twelve infants. The experiments went on for six consecutive days. Four infants were used in each of three experimental conditions. During the first two days the experimenter leaned over the baby's crib with an expressionless face. In the second two days the experimenter reinforced vocalizations by simultaneously smiling, clucking, and lightly squeezing the infant's abdomen. During the last two days he maintained an expressionless face as he had during the base line period. The results indicated a significantly greater mean vocalization rate for the conditioning days than for the base line days and a lower vocalization rate for the extinction days. This study shows that the conditioning of the infant vocalizations to social responses of an adult is possible as early as three months and that the social response of an adult can serve as a reinforcing stimulus.

In another study with three-month-old institutionalized infants, Weisberg (1963) manipulated the social environment through eight consecutive days. When an unresponding adult was introduced and made a part of the environment, the infants did not increase their responses. However, when the adult briefly touched the subject's chin and simultaneously smiled at and "talked" to him, the infant's vocal behavior increased.

Most prominent among an infant's waking activities is looking. His eyes move freely and often as he fixates on one object after another. Hearing a sound, he moves his head until his eyes locate the source. When his hands close on an object, he looks to the object. When he is placed in a prone position, he moves his head freely and looks. When picked up, his first activity is to look around him. At this age before he can reach out and grasp an object, he is already picking up the physical environment but, as Gesell has said, "with eyes alone." Some objects obviously excite the visual regard of the infant more than others; these might be considered as arousers of attention. For instance, he looks at bright and shiny objects and at the lines of demarcation between brightness and darkness.

Above all, changes in movement in the stimulus object apparently arouse the infant's visual regard. He seems to be attracted to the novel and the complex. More than to any other single object, he seems to be attracted to the human face. On occasion, of course, the infant will give evidences of delight to such nonhuman social stimuli as sunbeams, configurations on the wallpaper, a rattle or some other bright object in his crib, or to the presence of other objects which may momentarily draw his attention. However, it is the adult face which apparently attracts his attention most and which provides the basis for social interaction.

It is as he views the human face, usually his mother's, that the child provides the most obvious display of social responsiveness. It is socially significant perhaps that the face moves in response to the infant's own movements. If the infant smiles, the mother smiles; if he vocalizes, she vocalizes in turn. Rheingold (1961) feels that the human being is merely another complex of stimuli; but because the mother is living she is more interesting, and because she is human she is more responsive.

In summary, Rheingold feels that during the infant's visual exploration of his environment, certain objects attract and hold his attention. To the most interesting of these, he gives facial, vocal, and bodily responses of delight. It is apparent, then, that long before the infant begins to use speech or to respond actively to the speech material of adults around him, he is engaging in a kind of visual, social responsiveness which is stimulating to the child and which involves reciprocal exchanges with adults in his environment. Ultimately these exchanges may be an important feature of his speech and language development.

The effects of these visual and social experiences are differentially apparent in the patterns of development of institutionalized and home-reared infants. For instance at about three months of age, the institutionalized and the home-reared infants, as shown in the studies of Rheingold (1961), are apparently on about the same level of development. They respond with approximately the same kind of alacrity and with the same smiling modes and other socially responsive traits. However, studies by Province and Lipton (1962) indicate that thereafter the institutionalized infant quickly becomes relatively less active and less responsive than does the home-reared infant who has probably, to a marked extent, attached himself to a mother figure.

It seems apparent that this more rapid learning on the part of the home-reared infant is at least partially due to the fact that he relates more intensively and more frequently to a single adult and thus comes to be perceptually more attentive to the behaviors of this single person. The intensity of this communicative relationship provides a richer kind of social exchange at an earlier age than is possible for the institutionalized child. This richness of social exchange can be seen in the frequency of smiling and other social responses and also in the earlier and more precocious attention to the vocal and auditory components of the behaviors of the selected adults. Thus vocalizing becomes part of an active response system between the adult and the child. It is possible that this earlier development of an "interpersonal system" is one of the stimulants to rapid development of language.

In the early prelinguistic periods of development, then, it seems important for the infant first to get a rich experience in social interaction with adults. The social experience may also be described as sensory stimulation through the mediation of adult "caretakers." This stimulation may be predominantly visual for the very young infant; but it includes also tactual, auditory, and kinesthetic modes. Casler (1961, p. 49) has suggested that children "maternally deprived" before the age of six months probably are "perceptually deprived." Perceptual deprivation is defined as "the absolute or relative absence of tactile, vestibular, and other forms of stimulation." Casler states also that "recent neuroanatomical findings, especially those concerning the reticular formation, help to explain why perceptual stimulation is so important for normal development." Thompson and Schaefer (1961) writing on early environmental stimulation speculate that "the mother . . . may be important to the infant in the first few weeks of life because the handling she supplies keeps him aroused and alert. . . . This alertness allows opportunity for neural organizations to be built up via the specific sensory pathways."

Usually at sometime between three and five months of age, the infant becomes selectively aware of the identity of a person, most often the mother, who is able to mediate the world to him through visual, auditory, and tactual impressions. Thus he becomes gradually more aware of the world outside the range of his own reach and beyond the limits of his crib. He becomes more communicative and is able to explore alertly and with increasing accuracy.

ATTACHMENT

During the period which we usually call babbling and echolalia, it is apparent that the response system between the child and the adult becomes even more active. It thus becomes evident that there is an attachment formed between the infant and the mother (or person taking care of the infant) in home environments. Schaefer (1963) has advanced a hypothesis in three parts to explain the child's development of attachment behavior. He indicates that attachment behavior is simply a child's social attachment to a person, usually the mother, which seems to influence his responses to social stimuli that are provided by this person. The concept of attachment seems applicable especially during the period from approximately six to approximately fourteen months. Schaefer's three-stage hypothesis includes an early phase in which the infant seeks optimal arousal from all parts of the environment. During a second phase the infant, having learned that social objects provide the best source of stimulation, shows indiscriminate attachment behavior to all human beings. This second phase then finally gives way to a still later phase during which the child forms a special attachment or attachments to those in his immediate environment.

The three-stage hypothesis of Schaefer may be analyzed then as follows. First, the infant finds objects in his environment to be intriguing and interesting. He visually attends these objects and learns to smile in relation to them, his smile being something more than just a visual regard for the object. He comes then to learn that social objects, particularly faces of people, are the most interesting and the most responsive of all; and therefore he becomes attentive to these objects and smiles in greater frequency and duration in direct relation to them. Fortunately, these social stimuli also respond to him, and consequently there is an intensification of the exchange that takes place. The third stage, of course, is the one in which the child develops a preference for some adult or adults and forms an attachment. To these people he responds with greater intensity and takes on a wider range of social behaviors interactively.

During the period of attachment, Schaefer (1963) feels that children differ markedly in the amount of stimulation they seek. Whereas some babies will lie in the crib or participate in a social experience with an air of contentment and relaxation making few demands upon the parent, other babies will insist upon viewing everything and will not want to miss anything during an experience such as a walk or a play activity. They may, for instance, show a tendency to cry the moment that they miss out on anything.

Schaefer (1963) feels, then, that there is a need for the parent to provide a condition of mutual adaptation so that the parent's responses are cued somewhat by the needs and demands of the infant, and, again, the infant can learn through experience to respond to the tendencies of the parent. Consequently, there is a mutual exchange so that there are appropriate amounts of stimulation provided the infant during this critical (attachment) phase. If infants are left to cry excessively either through boredom or "separation," they become upset. The child shows special concern when he is separated from the person with whom he has formed the attachment. The infant's reactions to separation seem to reach an optimum at about seven months of age. As early as five months the infant may show concern for separation, but he is more likely to be concerned about separation from any caretaker figure whether or not this person may be the parent. In contrast, the more personalized and focused concerns expressed by the seven-month old are indications that the child has come to view people more selectively and that he has formed an attachment for the selected one(s). For this reason Yarrow (1961) suggests that this may be an unfortunate time for changes in the child's home placement. Stability in the maintained mother-child relationship may be more important than is popularly believed.

Yarrow (1961) has reviewed a number of studies of the effects of early deprivation on infant and child development. During the early months corresponding to the usual babbling (attachment) period, he describes the mother as a mediator who provides sensory stimulation to the infant through tactual, visual, and auditory media, for instance, through handling, cuddling, talking, and playing with the child, as well as by simply being visually present. The mother also acts as a mediator of the environment, sometimes buffering and sometimes heightening the intensity of the stimuli. The meaning of these mothering activities to the child and the impact of the mother's absence varies with the child's perceptual, cognitive, and motor capabilities at different developmental levels. On the simplest level, if the mother is not present, the infant may be deprived of social and environmental stimuli which a mother ordinarily makes available to him. At this point, the mother's absence represents a deprivation of distinctive stimuli offered by a social being. The impact on the infant may be even more severe since the mother's frequent or prolonged absence is often accompanied by deviations in patterns of care, such as failures to respond to the child's physical needs and wants or long delays in providing gratification. The significance of these kinds of frustrating experiences will be modified by the length of time during which they operate, by the developmental level of the child, and by the degree of autonomy which he has achieved.

Yarrow (1961) devised a concept of deprivation in three distinguishable areas: sensory deprivation, social deprivation, and emotional deprivation. In many settings during this period of attachment, all three types of deprivation occur and may be complexly related, but they do not necessarily vary concomitantly. I assume that they can be independently manipulated in research. The studies on sensory deprivation in animals indicate that complete restriction of perceptual experience in early life results in serious impairment of the function. The degree of sensory deprivation is less severe in institutional environments than in the described animal studies; nevertheless, developmental retardation is found in institutions, with the degree of deprivation correlating generally with the extent of retardation.

Social deprivation probably leads to disturbances in social functioning, such as social apathy and social hyperresponsiveness. The simplest hypothesis related social apathy to inadequate social stimulation during a developmental period which is critical for the acquisition of social responsiveness. If social deprivation occurs after appropriate social responses have been learned, intensified seeking of social response may occur. Yarrow (1961, p. 484) presents a refined hypothesis regarding the significance of the timing of experiences in the critical phases. The hypothesis holds that there are points in the developmental cycle during which the organism may be particularly sensitive to certain kinds of events or most vulnerable to specific types of deprivation or stress. "On the basis of our knowledge of the developmental characteristics of children, one might postulate differing vulnerabilities at different periods of development. . . . With regard to separation, the period during which the child is in the process of consolidating a relationship with his mother may be an especially vulnerable one."

In the period following the six or seven month's stage of attachment, it becomes apparent that there is an active imitation or response pattern on the part of the child of the mediating adult. It is also apparent that the adult can imitate the child during this time and elicit further responses from him. The child also is able to alter his behavior in response to the stimuli models provided by the adult. Here again we see that there is an active kind of learning experience which may ultimately lead to more evolved communication behaviors.

WORD ACQUISITION AND SOCIAL EXPLORATION

The third critical stage, namely, word acquisition and social exploration, may be assumed to begin roughly at twelve to fourteen months. This corresponds generally to Scott's (1963) *transition period* II, which he assumes to extend up to approximately twenty-four to twenty-seven months. He describes this as a period of increasing independence in locomotor functioning and verbal utilization. The child understands human speech to an increasing degree and begins to use his own verbal efforts to control his environment. The child's verbal experiences, of course, did not actually begin at this time; probably as early as eight to ten months he had a degree of understanding of the symbolic behaviors of the adults around him. He was able to recognize certain words, phrase structures, intonations, and symbolic gestures as having meaning. The starting point of his own meaningful voluntary use of vocal language is difficult to distinguish. "The first word" as reviewed by Darley and Winitz (1961) suggests a wide range of different criteria. However, in any event an adult auditor usually determines that a word has been used appropriately in a context before we can meaningfully attribute the word usage to the child. Words are likely to be rather slow in emerging for approximately six months after he uses the first one. During this time the child's vocabulary may not extend beyond a handful of appropriately used symbols.

The utterances learned in the period from twelve to eighteen months are likely to be learned as whole units and may actually be a composite of several words used by the child as one response. However, they have one-word type characteristics in that they imply a specific action or a specific object. This is the period of the one-word sentence, where a single word or wordlike utterance can have a multiplicity of meanings and can be used in many different situations.

Piaget describes six stages within his larger period of sensory motor development (Flavell, 1963). The fifth of these stages is especially relevant to the study of word acquisiton. Two of the principle functions the child engages in during this time are *imitation* and what Piaget calls *elaboration of the object*. During this period, too, the child reaches a level of physical independence. The new objects become coherent and ordered. Spatial, temporal, and causal relationships are perceived, and verbal communication becomes important as a means of closing the spatial gap between himself and others. It is significant, perhaps, that at this time the child has mastered the ability to imitate speech responses of adult models. He also has some words or word approximations to use as a handy means for attracting attention of these adult figures. During the word acquisition phase, then, the child is likely to use word responses which eventually come to resemble closely the verbal units used by the parent. The responses are also soon used purposefully in communication contexts; however, since the meanings which the word has for the adult may differ radically from the connotative and referent meanings it has for the child, there may be some basis for critical misunderstanding.

This possibility is highlighted in Piaget's description of symbols as more or less private noncodified signifiers which usually do bear some objective similarity to their referents but which nevertheless are considerably private and personal to the infant. He further describes the first signifiers as private nonverbal symbols which emerge toward the end of the period of sensory motor development and which initially may not be linguistic signs but which can best be called symbolic functions. He feels that this function gives rise to the acquisition of words rather than the acquisition of words giving rise to the symbolic function. In essence, he feels that what happens is that language first acquired through the auspices of a symbolic function lends tremendous assistance to the subsequent development of the latter. Piaget assumes, then, that the first signifiers of the child are private symbols rather than social signs. Perhaps the first words a child acquires function as semisigns or signs which are thoroughly impregnated with private symbol characteristics. These semisigns refer much more to idiosyncratic and ever-changing schema of action than to fixed and stable classes of objective realities. For a long time the child may find verbal signs to be both difficult to grasp and generally unsuitable for the representational expression of the entities with which he is preoccupied. He responds to this state of affairs "both by continuing to rely heavily on nonverbal symbols and by simulating words to his symbolic orientation . . ." (Flavell, 1963, p. 155).

Piaget further states that the egocentrism of the small child makes him unaware of the differences between his own private orientations to words and the orientations of adults. He may, in fact, use a word which has only idiosyncratic meaning for him and encounters considerable reaction from adults who may assume that he is using the word in its more standard sense.

Luria (1961, p. 17), talking about the acquisition of words, gives a substantially different picture from the one generated by the system of Piaget. Luria emphasizes the importance of the infant's continuous interaction with the adult world. In referring to the child's dependence on the mother during infancy, he describes the emerging speech in terms of the mother naming various surrounding objects and then giving the child orders and instructions. In this way the mother shapes his behavior. Having carefully observed the objects named by his mother after he acquires the faculty of speech, the child begins to name them actively enough to organize his acts of perception and his deliberate attention. "When he does as his mother tells him he retains the traces of verbal instructions in his memory for a long time. Thus he learns how to formulate his own wishes and intentions independently, first in externalized and then in inner speech. He thus creates the highest forms of purposive memory and deliberate activity. What he could previously do only with adult help, he is now able to do unassisted. This fact becomes a basic law in a child's development."

Luria feels that many psychologists overlook the social origins of these mental processes. Instead, they interpret active attention and deliberate action as being the inherent properties of mental life, which they believe to be rooted in the depths of the mind and not in the real external forms of the child's relationships. He feels that these complex processes can be studied step by step beginning with early infancy.

> When a mother shows a child something and says "cup," first her pointing and then the name of the object cause an essential modification in the child's perception. By the laws of temporary links, the mother's gesture and the word designating the object become secondary signals causing marked changes in the range of stimuli acting on the child. In isolating the object from its environment, the action of pointing reinforces the stimulus, making it a figure set in a ground. The word designating the object delineates its essential functional properties and sets it within the category of other objects with similar properties; it serves a complex task of analysis and synthesis for the child, and later settles into a complex system of links acting on him and conditioning his behavior (Luria, 1961, p. 19).

Thus, the infant becomes capable of actively modifying the environment that influences him. By using speech for himself he alters the relative strength of the stimuli acting upon him and adapts his behavior to the influences thus modified.

Luria thus speaks of speech as being an added dimension in the child's experiences with the surrounding world. By giving names to objects, he actually changes the perceptual functions these objects play in his life. He is able, therefore, to relate symbolically, starting with the primary function of naming and progressing to a relationship to the surrounding world which is basically symbolic in nature.

Whether one orients to the primary stages of intellectual development as described by Piaget or to the socialization processes as described by Luria, it is apparent that the period of word acquisition constitutes a transition on the part of the infant from the more dependent state of infant life to a more exploratory and active relation with the world. It is also apparent that the interaction between the infant and adults in his environment play an important part in the nature of the child's language learning. It might be meaningful to examine this interaction in the framework of reinforcement theory, which holds that the child tends to learn whatever responses are reinforced either by some immediate drive-reducing reward or by some indirect secondary cue of an eventual reward. "Responses which are not so reinforced tend to drop out of the child's repertoire. The responses which are involved in these events may be direct responses to external stimuli or they may be operant responses which, like babbling, are somehow internally initiated" (Carroll, 1961, p. 333). The most ambitious effort to work out details of such a theory as applied to language learning is *Verbal Behavior* by Skinner (1957).

"This and other positions are summarized by Miller (1951) and by Osgood and Sebeok (1954). Miller and Dollard (1941) hold that the child has no native instinct to imitate or copy behavior, but can learn to do so even in rather early stages of language development, when imitative behavior is rewarded" (Carroll, 1961, p. 333).

How do words first acquire word meaning? That is, how does the child learn to associate a word (sign) with an object or event (significate)? Osgood (1953), Osgood *et al.* (1957), and Mowrer (1960) have discussed this intriguing problem area at length. They have suggested a classical conditioning mediational model to explain the acquisition of word meanings. Jenkins and Palermo (1964, pp. 162–163) discuss mediation as a principle feature in the acquisition of syntax. Their description is quoted in substance in order to preserve the accuracy of their statements. They ask,

> How does language get under way? We think the children imitate the speech around them. They imitate because it is a functional property of the nervous system, because they are reinforced for imitating by other humans, because imitation is secondarily reinforcing, and because very soon the behaviors involved have functional properties for them as instrumental acts. We believe that associative correlates between verbal behaviors and events in the world around a beginning speaker rapidly appear through simple s-r [stimulus-response] laws and that the labeling or naming in its broadest sense ought to be one of the earliest forms to appear. It is clear that many general classes of behavior are present before the speaker learns labels for the salient objects and events involved and we assume that the labels are readily used as instrumental acts within already developed behavior repertoires. It seems reasonable to suppose that these early labels are attached to the

> functional properties of the situation which are of importance to the child as the result of his experience with the world or to properties which are salient in his stimulus field . . . .

Studies of infants during the word acquisition stage are difficult to conduct primarily because of the private world within which children are reared. Consequently, there are only a few studies of children during the twelve to eighteen month period relative to the interactive effect of reinforcement upon the acquisition of behavior. There is, however, considerable general support, such as McCarthy's (1954) prediction that the quality of the child's early linguistic environment is the most important external factor affecting the rate of language development. Bossard (1954) has documented the very wide variations which exist in the role of language in family life. There are numerous studies linking the rate of language acquisition with socioeconomic factors and with factors such as institutional living as compared to home living. Generally, it is assumed that there is some correlation between the rate of the child's acquisition and the amount of experience that he has had with adults and with a variety of material and stimuli in his environment. Experimentation generally suggests that there is a tentativeness about the child's exploration of his environment during the early months of the second year. He is therefore open to experience but perhaps easily dissuaded from the acquisition of verbal symbol behavior.

LANGUAGE ACQUISITION AND SOCIAL EXPERIENCE

Beyond the word acquisition stages, small children begin to use combinations of words which can be analyzed in more complete form by means of linguistic assessments in such areas as phonology, morphology, syntax, and semantics. Even though the first words of a more complex nature may still seem similar to the one-word acquisition phase, it is likely that a meaning has been expanded so that the symbols are actually more like complete thoughts. For example, "Teddy," for "Teddy Bear," may mean "Give me my Teddy Bear" or "I want my Teddy Bear" or "Where is my Teddy Bear?" or any one of many other possible such meanings. Miller and Ervin (1964) suggest that the child begins forming primitive sentences of two or more words before his second birthday. They find, however, that the grammar of these sentences is not identical with the adult model but that it is possible to translate their utterances into the adult model by the acquisition of certain function words and inflectional affixes. Brown and Fraser (1963) have called this a telegraphic version of English. They suggest that young children are exposed to a much more complicated grammar than they use. The telegraphic English is not learned from adults but rather is an indication of an upper limit of some kind of immediate memory span. Span limitation is probably the factor compelling children to reduce adult sentences.

The function of limitation, however, does not explain why some morphemes are dropped and others retained. Brown and Fraser suggest that the child may employ a "recency effect" in that he is able to pay particular attention to material in the final position, material that carries a lot of meaning.

If we wish to break language down into some linguistic segments, we might best begin with a discussion of *phonology* and include then, in order, discussions of *morphology, syntax,* and *semantics.*

Phonology[1]

Studies of the phonological development of children have in most instances used the techniques of the descriptive linguist and have described the phoneme system of a number of infants (Leopold, 1947; Velten, 1943; Albright and Albright, 1958; and Applegate, 1961). From this point of view, the phoneme system of learning is described as the progressive differentiation by the child of the phonemes of the community language (Jakobson and Halle, 1956; and Berko and Brown, 1960). At each stage of the development, the phonemes of the child show increasingly the characteristics of the phonemes of the adult. An orderly sequence of this development has been tentatively put forth by Jakobson and Halle (1956).

It is recommended that the Jakobson rules of substitution be used in studying the phoneme development of a small number of children. Research to date suggests that the child's phonological system closely approximates the model of the adult by the fourth year. Longitudinal studies of the phonological systems of children should reveal their comparative rates of development and the degree to which substitutions are retained at different age levels.

Careful assessments of the phonological development of children, then, would provide a prediction as to points of comprehensibility for given words or possibly for phrases which can be analyzed for accuracy and for possible comprehension by adult listeners. In this way the functional articulation of children can be analyzed in relation to the demands of the communication situation.

Morphology

It is likely that morphological data will show considerable influence of subcultures upon the speech development of children. The preschool child's knowledge of morphological rules as tested by Berko (1958), Berko and Brown (1960) could be determined. At what point does the child start to form plurals of nouns, past tenses of verbs, or add the *s* morpheme to indicate third person singular of verbs in the present tense? At what age and how closely does the child acquire conformity to the morphological patterns of the home and community? Are such patterns easily modified by a nursery school setting?

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[1] See definition of phonology, morphology, syntax, and semantics given by Carroll in Chapter 3.

Syntax

The syntax of children can be studied in reference to variations in the normal acquisition of a grammatical structure. Data can be derived by evaluations of generative grammar (Harris, 1961; Chomsky, 1957; and Lees, 1960), which can be designated to show the nature of the child's grammatical system. Generative grammar presumes speech behavior to be guided by a series of implicit behavioral decisions. These decisions are selections of linguistic elements, that is, words, grammatical elements, and syntax. These decisions presumably generate speech.

The work on evaluation of syntax by Brown and Fraser (1963), Brown *et al.* (1964), Lenneberg *et al.* (1962), and Miller and Ervin (1964) should be carefully studied in developing a method for evaluating the development of syntax. The general hypotheses put forward by Jenkins and Palermo (1964, p. 163) might be carefully studied as evaluations of syntax are made available. They suggest that reinforcement and primary stimulus generalization play a part in the emerging development of syntax. If the child makes a construction which is like the adult construction, they assume that this:

1. Has a greater likelihood of being praised by others;
2. Has a greater likelihood of inducing others to respond linguistically which we presume is reinforcing;
3. Has a greater likelihood of eliciting nonverbal behavior from the audience, if any; and
4. Is secondarily reinforcing. All of this (they feel) should lead to the greater selection of some sequences over others with this particular operator and, because of the semantic correlates probable in the successful utterances, to a semantic correlate of the class.

In support of their hypotheses, Jenkins and Palermo (1964, pp. 166–167) point the findings of Werner and Kaplan (1950), Brown (1957), Berko (1958), Berko and Brown (1960). In particular they feel the findings support the view that children shift from sequences to classes and thus develop their own semantic systems, which are then employed in their own selective utterances. Again, the development of similarities between the child's syntactical development and the syntax of the parent can be used as a basis for comparative study.

Semantics

The semantic evolvement of a child's language may be considered in relation to his development of concepts. Conceptual development seems to be closely correlated with measures of intelligence, and both may be influenced by conditions of reward in the child's environment. Considerable work has been done by Luria (1961) and others in studying environmental influence on concept development. Perhaps their work can best be understood within the framework of what they call the *second signal system,* which is a term often used in contemporary Russian psychological and physiological literature. Briefly, the second signal system is the portion of the nervous system that is concerned with verbal behavior. The second signal system enables us to respond to words as "signals of signals." Just as a light may act as a signal for the impending appearance of food, the word *light* becomes a signal for the light. Of course, a verbal stimulus affecting the second signal system does not, in general, stand for one particular stimulus of the first signal system. It stands for a whole class of nonverbal stimuli with a certain property or set of properties in common. The second signal system thus makes possible high levels of abstraction.

There are several differences between the first and second signal systems. For one thing, the second signal system seems to work according to something like the old principle of association by contiguity. If a word is frequently encountered together with an object that the word represents, the object will acquire an association with the word, and the word will evoke responses appropriate to the object. The associations on which the second signal system depends can be formed rapidly. It is possible that the associations can be formed as one-trial learning and be retrained over a long period of time. The learning available through the second signal system can also be amazingly flexible. The concepts inherent in the second signal system can be used profitably to study young children, and it is this work which is of particular significance in the Russian literature.

Very early the work of Ivanov-Smolensky pertained to the study of generalization involving verbal stimuli. He found repeatedly from the start that there would be considerable generalization between a verbal stimulus and its corresponding nonverbal stimulus. For example, if a child were taught to perform certain responses upon perceiving a bell, the word *bell* would be found without further training to evoke the same response. Similarly a response that had been established to the word would generalize to the corresponding nonverbal stimulus. There were also studies of generalization between words as to be expected. A response will generalize from written to spoken versions of the same word.

Particularly interesting are cases of semantic generalizations. Carroll (1964) suggests that the semantics of grammatical transformations would be especially interesting to study. He suggests an approach which might provide valuable information on the psychological antecedents or stimulus conditions that evoke characteristic responses in children. He suggests that deficient communication responses of some children may indicate inadequate experiences in choosing an appropriate sentence type for a given situation.

APPLICATIONS OF DEVELOPMENTAL INFORMATION TO THE STUDY OF MENTAL RETARDATION

Mental retardates often are not diagnosed until the second or third year in school. For this reason subject populations in mental retardation studies often are made up of older children simply because they are accessible. Unfortunately children in special classes cannot be used to provide data regarding language development. Children with delayed language brought to child guidance or diagnostic clinics, where small children are routinely studied, are perhaps more appropriate subjects for such research. In such instances it might be expected that the linguistic dimensions just described could be utilized in studying small children and their parents. Other and perhaps more fruitful approaches to the study of language development and its possible relations to the understanding of mental retardation could be undertaken in communities where predictably high incidences of retarded functioning are to be found. Such settings might provide the best opportunity for studying the "delayed" language of infants and toddlers. Studies of selected groups of small children might, in such settings, be carefully developed; and data might subsequently be used as a means for analyzing the development of the child in retrospect. Children who subsequently experience difficulties in school and present problems of poor achievement and poor social behavior with accompanying language deficits and who fall below "normal" levels on an intelligence test might therefore be studied in light of language data which had been carefully recorded over time. In this way we might be able to describe the language development of the child in relation to carefully developed information regarding the types of family influence, language models of the parents, and perhaps the type of reinforcement which was characteristically made available to the child during the months and years antecedent to the educational diagnosis.

Perhaps in this way we can more fully understand the impact of the environment upon the child's language acquisition and the relation of language to academic and social performance. Also, through selective treatment programs during the preschool years we can better understand the potential of treatment approaches for altering the patterns of language in accordance with more desirable forms.

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CHAPTER 7

NEUROLOGICAL APPROACHES TO MENTAL RETARDATION

Joseph M. Wepman

I have recently completed a manuscript on minimal brain damage,[1] in which the thesis I espoused was in effect a comparison of the effects of brain damage versus cerebral agenesis on the learning problems of children. I upheld then, and still do, that for most retarded children, whether the emphasis of their retardation is in the intellectual domain or in language acquisition, the generalization of brain injury from behavior without positive neurological sign is untenable and that a more useful concept is failure of neural development or agenesis. That argument is now in print, and the reasons given are available (Kirk and Becker, 1963).

In exploring neurological approaches to mental retardation, it not that cerebral agenesis is not in itself a neural etiology, but that for the most part in the nonphysically handicapped retarded child the evidence for neurological damage with specificity of dysfunction implied is true of relatively few children. It is the atypical, rather than the typical, diagnosis. It is of far greater importance, it seems to me, to study the behavior of the retarded rather than to search for the ever-elusive cause until we can demonstrate that etiology plays a significant role in the learning capacity or learning potential of the child.

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As I thought of this, however, it appeared to me that perhaps the most useful contribution to research in this area might well be in full consideration of this very factor, for example, the presence or absence of demonstrable neurological lesions. In order to illustrate this point and thereby emphasize its importance, I should like to refer to specific research in which we have undertaken to establish clinically useful diagnostic procedures for the differential diagnosis of language impairment in children. The procedures are based in part on the prediction that discernible differences will obtain if the population studied is viewed from the etiological viewpoint; to wit, whether or not the children have a positive neurological deficit. It is predicated from clinical evidence that, in the language behavior of the children with certain explicit exceptions, no differences will be found. However, this is yet to be proven. The overt nonlanguage behavior may well differentiate the two groups whereas the language disability may not. For example, it is widely accepted that a counterpart of neural trauma in behavioral terms is to be found in the lack of control, the lack of inhibition, and the inconsistencies of behavior such children demonstrate. The non-brain-injured child, on the other hand, may show an equal ineptitude in vocabulary usage or comprehension but usually will be less volatile; in fact, he may even be passive in most situations.

As a first recommendation for a single parameter in research design for the mentally retarded, then, I would strongly urge that the neurological deficit be recognized and that the interpretations made from the research be made in terms of children with known deficits, as compared with children whose etiology does not indicate specific neurological trauma.

One piece of research has been reported which related the findings on a retarded population by two professional disciplines, namely, neurology and psychology. Each studied the same children independently and supposedly from their own idiosyncratic viewpoint. Nevertheless, the neurologist and the neuropsychologist arrived at remarkably similar findings. It was pointed out that the children being studied differed markedly in the presence or absence of positive, demonstrable neurological signs. It later became evident that the neurological examination and the diagnostic decisions based on it relied as much, if not more, on the behavior of the children as on neurological signs. It was also pointed out that in many instances the psychologist was making his decisions frequently on what could be described as neurological signs. Thus, the patient's gait, psychomotor activity, history of seizures, tremors, and so forth, rather than the purely psychological signs of the evaluation procedures were reported. In other words, both disciplines were using the same behavioral and/or neurological criteria in arriving at their decisions and, in consequence, were sure to arrive at similar nosological groupings.

The conclusion drawn from this is no argument for or against neurology or psychology but rather that decisions regarding the presence or absence of neural deficit should be based on observable and demonstrable neurological signs, not upon the observations of behavior. Conversely, psychological determinants should be based on psychological evidence and not upon neurological signs, regardless of the discipline reporting the findings.

This, then, would be my second recommendation. It is perhaps best seen as a subrecommendation to the first. When populations of mentally retarded are studied and neural etiology is to be used as one of the independent variables, then the decision for placing children in one group or the other should be based on neurological rather than behavioral signs, regardless of who makes the determination, the neurologist or the psychologist. The converse should, of course, be equally true relative to behavioral indicators.

Within the domain of the neurological deficit itself, a series of recommendations for research seem evident. These recommendations perhaps can be subtended under a single topic, the concept of neural function held by the researcher. For example, it is well known that the brain, the organ of thought and the mediator of behavior, is understated when it is said to be a most complex organism. It is imperfectly understood both from the viewpoint of its organization and even its location. For myself, dysfunction of the brain in the mentally retarded is accepted as being of at least two varieties: There may be very specific lateralizing perceptual disabilities affecting unique input or output processes or there may be very generalized disabilities affecting all cognition. This construct is especially useful in the consideration of my own area of greatest interest, the development and use of language.

The specific input and output pathways affect the stimulability of the central process. When a particular problem can be defined in terms of modalities, where visual versus auditory versus tactual-kinesthetic disorders can be isolated, then brain damage or, better-named, brain impairment can more readily be conceived. Where the total conceptual ability is retarded or undeveloped and no modality pattern can be elicited, the problem is more likely to be the result of a generalized agenesis or failure of development. To be more explicit, specificity of disability along one or the other modality can be recognizably seen in study of the transmission of sensory stimuli or motor patterns caused by localizing trauma, whereas generalized intellectual disability or the inability to learn or comprehend or use the incoming stimuli is more easily understood as a gross failure to develop. (Notable exceptions to this are easily recognized.) Where trauma produces massive damage affecting both hemispheres in all of their aspects of function, no differential diagnostic problem seems to be present. Such children usually have such a multiplicity of problems, so many anomalies of development and function, that they are easily diagnosed as the multiply handicapped, severely retarded children. On the other hand, where the learning capacity, the function of general comprehension and use, is affected without multiple anomalies, the most parsimonious explanation is agenesis. With this distinction in mind, the exceptions can be studied holding constant the positive neurological indicators mentioned earlier.

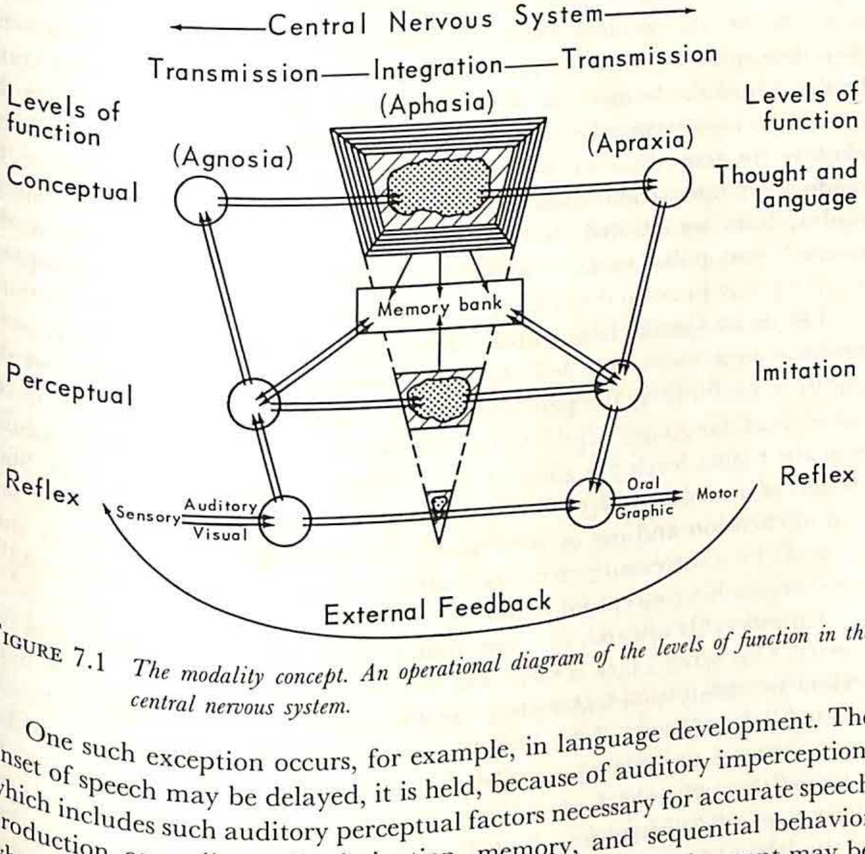

FIGURE 7.1 *The modality concept. An operational diagram of the levels of function in the central nervous system.*

One such exception occurs, for example, in language development. The onset of speech may be delayed, it is held, because of auditory imperception, which includes such auditory perceptual factors necessary for accurate speech production as auditory discrimination, memory, and sequential behavior where no specific trauma can be elicited. Thus, lags in development may be seen along quite specific modalities. Language or the ability to formulate, comprehend, and use verbal symbols may progress relatively unaffected by such perceptual disabilities within prescribed limits. Thus, the deaf child comprehends language visually; and the blind child comprehends, thinks, and functions with auditory signals even though he possesses no visual discrimination, memory, or patterning ability. The conceptual level, then, may be unaffected whereas the perceptual mechanism within the total neural construct may be impaired along one or another modality. This is not to say that a block in transmission along a modality does not affect conceptual behavior—indeed it does—but the impairment is limited and largely affects the ability to conceptualize; that is, less stimuli reach the central process for integration, and there is a real delimitation of the associations to specific acts of conceptualization. The child with an aural perceptual handicap has only visual and tactual-kinesthetic associations upon which to base his concepts. As a result, his cognitive ability cannot fail to be delimited and to suffer in its breadth of development.

My third recommendation, then, follows from this concept of neural organization. Research should isolate the defect in the retarded. First determine whether the problem is seen as a demonstrable neurological impairment, then determine whether the problem is perceptual or conceptual in nature. In the case of the former, questions arise as to where and to what degree the modality in question is limited and to how much of a role this delimitation plays in the acquisition of new learning. Also, how much adaptation can be made by compensation through the use of unimpaired pathways. If conceptual abilities are affected, and not the lower level perceptual functions, the research can point to the specific areas where making use of perceptual learning may increase the efficacy of the more complex conceptual functions.

Let us be specific here to the language act. If speech accuracy is not a problem in a given retarded child, the assumption can be made that the auditory pathway at the perceptual level is not seriously affected. If in the same child, language acquisition is delayed, then it is reasonable to assume that the higher levels are affected, the levels of language and thought. Such defects of function will produce concentrated delays in verbal acquisition. Comprehension and use of vocabulary will be delayed. It is necessary then to study how increased perceptual auditory training may assist the child in overcoming his conceptual defect.

Considerable research of a very useful nature has been established in this regard. One serious lack is seen, however, which points to the need for more exhaustive study on a wider plane. McCarthy and Kirk (1963) have demonstrated the usefulness of the modality construct following Osgood's model of neural function, which is so like the model developed independently by Osgood that, when both models were originally presented at a conference in Boston in 1959, it was seen that they could well be substituted one for the other (Osgood and Miron, 1963).

In the Illinois Test for Psycholinguistic Ability, which was developed following the model, the tasks presented and the protocols derived showed a reasonable first step in assessment of linguistic characteristics of learning with some less adequate measurement of the prelinguistic factors.

Frostig *et al.* (1961), approaching only the visual-perceptual task, also have been able to demonstrate that a variety of prelinguistic characteristics in learning may suffer from impairment of that modality.

The relationships between these prelinguistic factors and the linguistic processes involved in the acquisition of language should be studied at some length and with considerable rigor. Although this has been attempted in both tests mentioned, the results are inconclusive, both for the normal child with lags in development and for the brain-damaged child with modality involvement. Another lag is in our understanding of the shift from the lower level perceptual learning to the higher mental processes related to our earlier recommendation relative to the demonstrably brain-injured child and the impaired learner without known brain injury. Do they function alike in their development of concept formation, or should they be considered as separate types of learning problems requiring different approaches?

Research in linguistic function in brain-injured adults has shown differential abilities of aphasic patients to utilize their decoding and encoding of semantic substantive words from their use of the highly frequent function words. Do such differences exist in the brain-injured mentally retarded child? Or in the child with agenesis? Are they able to acquire syntax but fail in acquiring the semantic aspects of language? Look for a moment at a parallel between children's acquisition of language and the adult aphasic classification that comes from our psycholinguistic study of aphasia. Can specific mental retardation be described as an arrest at one or another of these developmental states, these stages of the acquisition of linguistic processes?

TABLE 7.1 *Comparison of the Development of Language and the Five Aphasias*[a]

Stages of Development	Stages of Aphasia
1. Speechlessness	1. Global
2. Babbling, cooing, jargon	2. Jargon
3. Fortuitous speech	3. Pragmatic
4. Substantive symbols	4. Semantic
5. Grammar	5. Syntactic

[a] After Wepman and Jones (1964).

A final brief comment on language research relative to the mentally retarded child: One of the problems in studying language and speech development for any experimental group is our lack of knowledge about verbal acquisition in normal unimpaired children. Partially, this is caused by the tremendous problems inherent in such a data collection project. We are presently engaged in this regard in extending our collection of data on adult spoken language to include children. In both cases the relative frequency of use and the part of speech of each word used are the dependent variables. When such data are available, certainly a comparison at different age levels of the language used by different levels and types of mentally retarded children would be in keeping.

Another facet of the difficulty in studying normal acquisition of language is the remarkable speed with which some children go through the stages of development of verbal communication. If it can be demonstrated that mentally retarded children go through the same stages at a slower rate of speed, the mentally retarded would provide a wonderful laboratory for studying the stages of acquisition of language. This concept, I feel, should be the subject of considerable discussion, and I make it my final recommendation that we explore its potentials at some length.

In summary, then, the following specific recommendations are made:

1. That the potential neurological deficit in mentally retarded children be recognized and that interpretations derived from the research be made in terms of the known neural deficit in contrast to that part of the population studied whose etiology does not indicate demonstrable neurological trauma.
2. That the various workers (such as neurologists, psychologists, and language pathologists) studying the mentally retarded express their findings in terms of their own disciplines and not in terms of disciplines with collateral interests.
3. That when neurological trauma or deficit is considered, it be stated in terms of the concept of neural function espoused by the researcher.

   For example, for myself this would mean expressing findings in terms of my concept of differential levels of function, perceptual and conceptual, and differential aspects of the input-integration-output trichotomy of neural function. Perhaps we could add that an explicit differential could be stated between speech and language studies as one means of deriving more specific information.
4. That the application of verbal language parameters in terms of frequency and part-of-speech categories be made to the study of the mentally retarded child.
5. That research into the links between prelinguistic and linguistic function be studied both in speech and language. This recommendation, of course, carries with it the corrollary which i mentioned only to place it on the record: that a distinction be constantly maintained between studies of speech and studies of language. Too frequently, it is held, these two are confounded, and the results are evident.
6. That the comparative stages of language development of mentally retarded and unimpaired children be studied to determine if the slower progress of mentally retarded children provides advantages for describing language acquisition.

It is with these recommendations that I feel we in the field can discuss neurological approaches to the study of mental deficiency, especially in regard to language and speech development.

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CHAPTER 8

PROCEDURES FOR EVALUATING PROCESSES ASSOCIATED WITH RECEPTIVE AND EXPRESSIVE LANGUAGE

Joseph E. Spradlin

INTRODUCTION

There have been several attempts to develop batteries of subtests for evaluating language (Seivers, 1955; McCarthy, 1959; McCarthy and Kirk, 1963; Spradlin, 1963). In general, the test constructors have focused primarily on the behavior of the individual being tested with little regard for language as it occurs in the community. Thus, for the most part, these tests have attempted to evaluate deficits in visual or auditory reception systems, deficits in vocal or nonvocal expressive behavior, or deficits in the relationship between receptive and expressive processes. Insofar as most of these constructors have been psychologists with a background in test construction, clinical psychology, or learning theory rather than linguistics, there are few items evaluating the acquisition of such language subtleties as the use of plurals, tenses, and transformations.

The Parsons Language Sample (PLS) (Spradlin, 1963), for example, consists of six subtests based on concepts derived from Skinner's book, *Verbal Behavior* (1957). Five of the six subtests could be adequately mastered by a subject whose expressive verbal behavior consisted only of one-word responses. The sixth subtest requires the subject to imitate a series of digits and sentences of varying complexity.

The Illinois Test of Psycholinguistic Abilities (ITPA) (McCarthy and Kirk, 1963) consists of nine subtests, any one of which could be mastered by a subject who emitted only one-word responses. One of the subtests (the auditory-vocal automatic ability) does provide a means for analyzing some aspects of the child's grammatic structure. The ITPA does test for grammatic rules using words which are familiar to the child rather than using nonsense syllables. Thus it is impossible to determine whether the subject has learned the rules of grammar or is simply repeating a phrase he has heard. Moreover, one subtest (vocal encoding, which has the subject describe a picture) evokes responses from the subject which could be analyzed for phonemic and grammatic structure. However, the responses are scored on the basis of the "number of concepts emitted," primarily referential behavior.

The battery developed by Dorothea McCarthy (1959) evaluates picture naming, recognition of objects, and vocabulary. Ratings are made of the child's intelligibility and oral language usage; however, no specific directions are given concerning obtaining specific phonemic or grammatical deviations from the norm of the community.

These tests have made one major contribution to the study of language. Both the PLS and the ITPA formally recognize the distinction between *language reception* and *language expression.* This distinction seems justified. People talk and people listen. Moreover, being able to understand language and being able to use it are not perfectly correlated (Spradlin, 1963), and there are those who speculate that language reception is a prerequisite to language expression (Lenneberg, 1962).

Testing is frequently based on the assumption that the test scores allow decisions to be made concerning language training or therapy which could not be made if the test scores were not obtained. Even if the testing is not based on such an assumption, it is usually based on the assumption that the behavior which is being evaluated is relevant to some more basic criterion behavior. In the case of language evaluation, we would hope that the test was evaluating behavior processes which are both necessary and sufficient for communicating with our peers in the community.

When evaluation is considered in terms of community requirements, the PLS and ITPA leave a great deal to be desired. First, there is no clear-cut statement regarding how the processes sampled or evaluated by the tests relate to language usage in the community. Is adequate performance in the various areas sampled by the subtests necessary for communication in the general language community? In some cases it probably is. For example, it is unlikely that a person could communicate in the community if he could not label objects or pictures effectively, or it is unlikely that a person could get along in the community if he could not understand his peers when they provided certain conventional labels for objects. However, performance on other subtests may be irrelevant to adequate communication in the community. For example, imitation of another person's gestures, as is required by the echoic gesture subtests of the PLS, may or may not be important to communication in the community. But even if adequate performance on the type of tasks presented in the subtests are necessary for communication in the community, they may not be sufficient indicators of adequate communication. For example, two of the tests (the PLS and the ITPA) require no more than one-word responses. Certainly the community requires more. In brief, although the subtests are relevant, they are not adequate for sampling the terminal language required by the community.

A second problem with most of the tests is that even if we assume that adequate performance on the tasks sampled by the subtests are necessary, the test is not ordered in such a way as to indicate the point at which we should start training or therapy. Do we start training at the same or a different point with a subject who obtains five items correct as we do with a subject who obtains only one item correct? The subtests at best merely indicate which areas need training and give no hint as to where training is to begin.

Third, none of these tests attempts to make a differential prediction concerning which subjects may be trained by a given procedure to perform the tasks evaluated by a given subtest and which subjects cannot be so trained.

STRATEGIES FOR THE DEVELOPMENT OF LANGUAGE EVALUATION PROCEDURES

The above discussion has been based on two assumptions. First, that the purpose of language evaluation procedures is to allow for improved decisions concerning placement in therapeutic or training programs. Second, that the aim of a training or therapeutic program in language is to modify crucial aspects of the subjects' language so that they more nearly match those of normal members of the community.

Perhaps prior to developing language evaluation procedures, it would be well to discuss the development of language training programs. Persons expert in programmed learning would suggest that the first step in developing any training program is to establish the terminal behavior or behavioral goal of training. This is a difficult task for the person interested in developing a language training program. However, it seems that the place to start the development of such a program would be with a study of the language characteristics of normal members of the community. For this step, modern linguistics would provide an initial starting point in both content and methodology. Linguists have been interested primarily in discovering the rules of languages and have developed procedures for sampling language in the community and for classifying and analyzing the sample. This is not to say that the techniques or the conceptual system of linguistics are adequate. Many of the procedures which they use for collecting and evaluating data would shock the trained experimenter or psychometrician because they are, in the main, unstandardized and depend heavily on a human recorder of questionable reliability. They deal with language as a system and often overlook the fact that a language system is simply an abstraction from the behavior of individuals. Moreover, since they deal primarily with the language of normal adult members of the community, they often overlook the basic distinction between receptive and expressive language. Nevertheless, the linguists do attempt to determine in an objective manner how language is spoken and understood in a community. It is likely that the aspects of language which individuals of a community exhibit are the ones which are required for social acceptance in that community.

Once the language requirements of the community (the terminal behavior of the language program) have been established, the next phase is the development of the intermediate steps. In order to establish such steps, it would be necessary to study the development of normal children's receptive and expressive language. Once again, linguistics may provide a starting point for the discovery of developmental steps or sequences. If there are sequences of development occurring in a majority of children, these at least indicate a sequence of steps in which language can be learned and should serve as guidelines for developing intermediate program steps. This is not to imply that the "natural development of a child" is the only way or even the most effective way language can be developed; however, it is a way that language can develop and, as such, may provide initial guidelines for the development of a language training program.

Once the terminal behavior and the guidelines for steps of the program are established, the program constructor would, no doubt, draw heavily from general procedures of behavior modification and programmed learning. The procedures would include immediate reinforcement of desired responses, careful control of the sequence of presentation of discriminative stimuli, use of thematic and formal prompts, and the systematic fading of prompts.

No doubt the program, including both terminal behavior and steps, would have to be modified as experience was accrued. Perhaps data would show that certain subjects were incapable of acquiring certain language behavior. Certainly this might be the case with the deaf and other persons with specific deficits.

Test construction, once the language development program was established, would be a relatively simple procedure involving selecting key items from the program and administering them to the subject. The point at which the subject would be started on the program or programs would be determined by the item passed or failed.

GENERAL PROCEDURES FOR EVALUATING EXPRESSIVE AND RECEPTIVE LANGUAGE

In the following discussion no attempt will be made to present a battery of language tests. Such a presentation would be contrary to the above described approach. However, general procedures of behavior evaluation and specific techniques for evaluating a few of the processes associated with receptive and expressive language will be discussed.

Procedures for evaluating behavior have ranged from reliance on reports by unskilled observers (Doll, 1947) to evoking and recording behavior automatically in a fully instrumented laboratory situation (Skinner, 1938). Some of the general evaluation procedures are enumerated and discussed below.

Evaluation Based on the Observations of Untrained Persons

Evaluation based on observations by parents, teachers, and attendants has been used quite widely in clinical studies of the development of retarded persons (Strazzula, 1953; Lubman, 1955; Hartman, 1958). These reports have been used to evaluate both the current and the past status of the retarded person. Such unsystematic observations have been used on the rationale that persons in daily contact with the retardate are able to base their judgments on a much larger sample of behavior than is the examiner in a test situation. Moreover, the procedure may provide information which can be obtained in no other way. For example, these techniques have been used in an attempt to determine when the person said his first word, used sentences, and recognized parents. Even current behavior may be somewhat difficult to obtain except through unsystematic observations. For example, the report of the parent may be the easiest way of obtaining information concerning the child's behavior at home, in the grocery store, or in community social settings.

Usually evaluations based on the observations of nonprofessional persons have been very gross and unsystematic. However, it is possible to structure the observations of parents and obtain some of the kinds of data which are usually obtained by a trained observer such as a linguist.

The use of reports of the observations of untrained persons leaves much to be desired. First, the interrater reliability is difficult to check because often only one person (the mother) has observed the child in all of the key situations. Second, it is quite likely that the reports of such persons are biased.

Evaluation Based on the Observations of Trained Observers

Evaluation based on the observations of trained observers has also been used to study behavior in natural situations. Anthropology, ethology, and linguistics have all relied heavily upon such observations.

The observers of these disciplines observe the subjects in a wide variety of situations and systematically record what the subjects do. They attempt to observe and record the behavior without preconceptions. This, of course, is a vain hope, since the language or notation system which is used to record behavior will, in part, determine what behavior is recorded, and the observations made will depend on implicit notions concerning what behavior is important. In spite of its limitations, the use of skilled observers in natural settings probably offers considerable hope for discovering the language processes which are necessary for adequate communication in a community setting. Speech pathologists have also used the technique. Johnson *et al.* (1952) report on a widely used technique of recording fifty utterances verbatum. This protocol is then analyzed for such characteristics as mean length of response, number of different words used, and sentence complexity.

Evaluation Based on Audio and Video Tape Recordings

Evaluation based on audio and video tape recordings now seems to offer considerable promise in avoiding certain problems of observations in natural settings. First, the tape provides a permanent record of the behavior being evaluated. Thus, reliability of observers can be easily checked. Moreover, the tape allows the observer to examine the behavior as many times as is necessary to evaluate it in several dimensions. For example, an observer might run an audio tape through one time and evaluate phoneme production; on the second run, pitch; on the third run, tempo, and so on. Moreover, since tapes need not be observed in the same sequence in which they were made, they allow for the easy analysis of how an observer changes over time. They can also be used for training different observers to observe and record the same behavior.

The use of both audio and video tape recorders restricts the study of behavior to those situations in which adequate facilities for recording exist. Such factors as inadequate lighting, excessive noise, lack of space, and lack of electrical power outlets may make the use of recording equipment inconvenient if not impossible. Moreover, the use of such equipment may change the behavior being recorded from what it would be if no such equipment were present.

Evaluation Based on Standard Testing Procedures

Evaluation based on standard testing procedures has been most prevalent in the field of psychology, as illustrated by the mental test movement. The standard test adds more restrictions to the behavior sampled because it introduces control of the environmental setting and usually presents specific stimuli designed to evoke certain classes of responses. The PLS and the ITPA are prime examples of such a technique for evaluating language. In addition to these complex batteries, specialized tests for articulation or phonemic production, morphology, word recognition, and others have been developed (Ammons and Ammons, 1948; Berko, 1958; Lerea, 1958; Dunn, 1959; Templin and Darley, 1960). Standard testing procedures have the disadvantages of restricting the settings in which language is sampled and in the types of language sampled. However, they do provide a replicable system for evoking responses and allow for the easy identification and analysis of responses.

Evaluation Based on the Use of Instrument Techniques

Instrument techniques have also been used for evaluating certain aspects of language (Goldman-Eisler, 1951; Copeland, 1963; Nathan *et al.*, 1964; Leach, 1965). These techniques allow for automatic recording and evaluation of the response. The instrument techniques frequently have high reliability or replicability. However, they evaluate only limited aspects of language in an artificial setting. Many of the more important aspects of expressive language may be extremely difficult to evaluate without resorting to observers. For example, it would be difficult to develop an instrument to evaluate grammatical transformations.

The above procedures vary on three dimensions: (*a*) the extent of the behavior sample upon which the evaluation is based, (*b*) the precision and reliability of the data obtained, and (*c*) the similarity or dissimilarity of the evaluation environment to the natural environment of the subject. In the case of the fully instrumented laboratory, the behavior sample is usually quite limited, for example, pressing a button or vocalizing into a microphone. Moreover, the environment is usually quite different from the organism's natural environment. The organism is in limited space with limited alternatives, reinforcers, responses, or stimuli available to him. However, the data obtained are usually quite reliable and highly precise. At the other extreme, evaluations based on the reports of unskilled observers (for example, parents) may be derived from large and varied behavior samples from the child's natural environment. However, the data obtained from such persons may be imprecise and unreliable.

APPLICATION OF PROCEDURES TO THE EVALUATION OF SPECIFIC PROCESSES RELATED TO COMMUNICATION

The first section pointed up the limitations of current language evaluation batteries and suggested that persons developing language training and evaluation programs look at language used in the community to establish the terminal behavior. This does not mean that investigators are not aware of some of the behavioral processes which are necessary for adequate communication within one's community nor that procedures for evaluating such processes are not available. For example, there is considerable evidence that deaf persons develop neither adequate receptive nor expressive language. The following discussion suggests techniques which may prove useful for both the evaluation and the training of some of the processes related to adequate communication.

Processes Related to Receptive Language

I have consistently implied a distinction between language reception and language expression. This is not unique; the layman also talks of listening and speaking. However, the layman often treats speaking and listening as if they were perfectly correlated processes. On the other hand, the person who has worked with such pathological groups as the retarded and aphasic is impressed by the number of persons who exhibit a much higher degree of receptive language than they do expressive language. Moreover, it has been speculated that language reception is a prerequisite for the development of expressive language (Lenneberg, 1962). For this reason, the evaluation of processes related to language reception are discussed below.

Hearing evaluation There seems to be little doubt that hearing has an important role in both the development of receptive and expressive language. Although adequate hearing is not a sufficient condition for the development of normal language, it seems to be a necessary condition. The field of behavioral audiometry is rather well developed (Frisina, 1963; Lloyd, in press). Procedures are now available for testing the hearing of most retarded persons. Those retarded persons who score above 40 on an intelligence test can usually be evaluated with minor modifications of the standard techniques which are used to evaluate nonretarded persons. Greater encouragement and social reinforcement of correct responses to the signal may be needed, but the basic technique need not be greatly modified. Techniques usually need to be modified rather extensively, however, for testing children who score below 40 on an intelligence test. These modifications usually take the form of training the subject to respond to the tone by providing a positive consequence if he responds when the tone is presented. This positive consequence may be frequent praise, the projection of brightly colored pictures on a screen, or the delivery of a bit of food or liquid to the child (Lloyd, in press). The audiologist usually presents tones between the frequencies of 500 cps and 4000 cps. If the child responds to tones above 15 db across frequencies between 500 cps and 2000 cps, most audiologists do not consider hearing defect as a major contributor to language deficiency. This, of course, does not mean that the child does not have an auditory reception problem.

Pure tone discrimination It is quite possible that the child may be able to respond to all tones above a given level but not be able to discriminate between any two of them. Although evaluation of this aspect of auditory reception has not been developed with retarded children, there is no reason that the basic techniques which are useful in evaluating the child's response to pure tones could not be used to evaluate discrimination and generalization between tones of different intensity, frequency, and duration.

I recognize that there is little clear evidence that a child's ability to discriminate across a single dimension of sound—such as intensity, frequency, or duration—is strongly related to discriminations required in speech reception; however, it seems likely that failure to discriminate among one or more of these dimensions might seriously interfere with speech reception.

Phonemic discrimination Psycholinguists, such as Berko and Brown (1960), have provided a starting point for the evaluation of both receptive and expressive language. They have drawn heavily from linguistics in their analyses of language. According to Berko and Brown, we can speak of language at the phonemic, grammatical, or semantic level. The description at the phonemic level attempts to break language into its most elemental parts. The phoneme is a family of sounds which can be classed together on the basis of phonetic similarity and pattern of distribution (Gleason, 1961).

The phonemes of different languages vary somewhat. For example, in English [v] and [b] are distinct phonemes. In Spanish they are allaphones of a single phoneme found in complimentary distribution. In English "vabaco" and "bavaco" are possible words, and ordinarily a listener would know that they referred to two different concepts. In Spanish the second word would be acceptable whereas the first word might not; however, the listener would probably assume that "bavaco" was simply a faulty expression of "vabaco" rather than a different word. The phonemic structure for normal adults who speak any one of several English dialects has been rather well described. Developmental phonemics or the study of how phonemic structure changes from infancy to adult life has received some attention (Jacobson and Halle, 1956) but is much less adequate.

Ordinarily linguists have been primarily interested in general languages or sublanguage of a community. However, recently it has been suggested that a linguistic analysis of the language of a specific child might be made. Such an analysis of the phonemic system may reveal fewer phonemes than are found in conventional English, and furthermore it may indicate that certain phones which usually serve as independent phonemes in general English are free variants within a single phoneme for individual retarded children. This may be true for either the receptive or the expressive process.

Numerous techniques have been developed to evaluate phoneme discrimination (Templin, 1943; Pronovost and Dumbleton, 1953). Phoneme discrimination evaluation could be automated by having the child first press one button when any two sounds presented together were alike and a second button when any two sounds presented together were different. Once the child was able to do the task reliably, phoneme pairs would be presented. Some of the pairs would involve the same phoneme, and others would involve different phonemes. Such a procedure would indicate whether the child made the phonemic discriminations required in his community. Moreover, a variation of this same technique might be used to train conventional phoneme discrimination.

Grammatical discrimination Brown and Berko (1960) have divided grammar into two parts, morphology and syntax. Morphemes are classified as "bound" and "unbound." Unbound morphemes refer to verbal units roughly equivalent to simple words. For example, "cat," "dog," "run," and "of" are all examples of unbound morphemes. Bound morphemes refer to verbal units which cannot stand alone but change the meaning of the morpheme to which they are bound in a specific way. For example, the /s/ in "cats," "rivers," and "towns" indicates plurality, or the /t/ in "walk/ed/," "wrapp/ed/," and "chopp/ed/" signals a happening in the past. The rules for combination of unbound morphemes with other morphemes are rather specific. We can say "unhappy," but we cannot say "happy-un."

At a more molar level, the rules of English indicate how morphemes can be combined into sentences. At this level, the person studying language may be interested in such grammatical rules as agreement of subject and verb with regard to plurality.

Discrimination of grammatical structures might be evaluated with procedures similar to those described for the evaluation of phoneme discrimination. The child could be reinforced for pressing one button if an utterance were correct, and a second button if it were incorrect. Correct utterances would be presented most frequently, but the child would be heavily reinforced for detecting grammatically incorrect utterances. The initial utterances would be derived from language used frequently within the child's environment. However, once the child had been trained to select inappropriate word orders in familiar utterances, utterances would be introduced which contain words foreign to the child's experience to determine if the child can generalize to new material.

Furthermore, techniques for evaluating the discriminations involved in receptive language could be developed to evaluate whether the child discriminated such subtle but important distinctions as "the boys ran fast" or "the boy ran fast" or "the girl is home" or "the girl was home." Although it is quite possible in most cases to evaluate such discrimination with a simple single- or two-choice response system, such as the one described above, it would probably be most feasible to evaluate such discriminations by having the child imitate the utterances or make a multiple choice response to pictures depicting the referents to such utterances along with similar pictures not depicting such referents. Initial work of this type has already been initiated by Lerea, 1958.

Referential or semantic discriminations This brings us to a slightly more complex aspect of language reception, namely that of language referents or semantics. Although unlikely, it is entirely possible that a child could make all of the above discriminations and still have a severe language reception deficit. All of us could discriminate between the utterances "ug tak goo boo" and "nug tak goo boo," yet we would not be able to associate either with a "referent." A child might face a similar problem with two language utterances which would rather systematically control referential responding among other members of his community. Such a problem in identifying referents might occur either with single words or with more complex units of speech. General procedures have already been developed which could readily be modified to evaluate a child's identification of the referents implied by conventional language (Rosenberg and Cohen, 1964; Kraus and Weinheimer, 1964). A child could be placed in a room and pictures presented with a button under each picture. If we wanted to evaluate the child's ability to respond to the correct referent to single words, the words would be presented to the child and the child's response recorded. For example, on one trial the child might be presented a series of four pictures: a ball, a cup, a face, and a fish. The four words would be presented, one at a time, and the child's responses recorded. The Peabody Picture Vocabulary Test (PPVT) (Dunn, 1959) and the Ammons Picture Vocabulary Test are nonautomated techniques for evaluating complex visual and auditory reception and referential behavior. More complex aspects of language—such as discrimination between plural versus singular, tenses, and transformations—have been similarly evaluated by Lerea (1958). The specific items of a more complete language analysis would be determined by looking at the general linguistic characteristics of the community and the general requirements for adequate adjustment in that community.

Perhaps the most complex processes in language reception involve the execution of a complex series of tasks or activities based on speech instruction. Intelligence and language tests (for example, McCarthy and Kirk, 1963; Spradlin, 1963; Weschler, 1944; Terman and Merrill, 1937) have given clear recognition of the importance of being able to follow commands. Procedures for assessing ability to follow oral commands could be evaluated as they are in the current language and intelligence tests, or they could be fully automated.

If we desired to increase the complexity of the language reception evaluation, a delay could be interposed between the time the controlling linguistic stimuli were presented to the child and the time when he could make the required response or responses. There is relatively extensive literature on the effect of the delay between the stimulus and the required response, and some persons consider retardates to have specific deficits in this area (Ellis, 1962). Still more complexity could be added by interposing a second task or set of activities in between the presentation of the controlling linguistic stimulus and the required response.

The techniques suggested above may be fully instrumented, and I speculate that they would be highly related to the same processes exhibited outside the testing situation. However, the careful language evaluator would check his laboratory results by determining their congruence with both his own nonexperimental observations and the observations of others.

Processes Related to Expressive Language

We must talk as well as listen in order to communicate adequately. Although language reception is necessary for communication, it is not sufficient. Thus, any program for evaluation or training language must give consideration to the evaluation and training of expressive language. Whereas the technical problems in receptive language evaluation are minimal, this is not the case with expressive language. There are a few aspects of speech—such as speech rate, rate of pausing, length of pauses, and length of vocalizations—which have been evaluated solely by instrumentation (Goldman-Eisler, 1951; Copeland, 1963; Nathan *et al.,* 1964; Leach, 1965). However, it seems that the community may be able to tolerate extremely wide deviations along these dimensions of speech without considering the person to have a handicap. Thus, nearly all the expressive language processes which are currently considered important to communication must be evaluated by noninstrumented techniques. There are numerous problems with evaluation which rely on noninstrumented techniques (for example, human instruments) (Spradlin, 1962). Nevertheless, it appears that the person who is seriously interested in those aspects of language which are relevant to communication in the community is forced to use such techniques.

Prelanguage vocalizations Irwin and his associates (Irwin, 1960) have developed techniques for recording and evaluating the vocalization of infants. The procedures involve having a trained phonetician record by use of the International Phonetic Alphabet (IPA) the sounds made by the subject in thirty breath units. A variation of this procedure is to record the sound by tape recording and then to have trained phoneticians transcribe the sounds into the IPA. Through the use of this technique, the same vocalizations may be transcribed by different phoneticians and the reliability of transcription evaluated at a later time. While the transcription of infants would seem to be an extremely difficult task, Irwin and his associates report high agreement among trained phoneticians for transcriptions of both live and taped vocalizations.

The exact relationship between prelinguistic vocalizations and later language expression has not been specified; however, Spiker and Irwin (1949) did find a low positive correlation between early phonetic development of an infant and Kuhlmann Test of Mental Development scores. Moreover, as the infant becomes older the distribution of phones emitted comes to more closely approximate the distribution of phonemes used in adult speech. If subsequent study should indicate that certain levels of phonetic development consistently occur before higher stages of language development, it would suggest that such phonetic development may be a necessary prerequisite to later language development.

Phoneme production Speech correctionists have been most interested in evaluation and modification of the phonemic system of children. Their procedures for evaluating articulation have most often involved evaluation of the ability of a subject to produce a given phoneme in a single-word context or in isolation. Standardized tests are currently available for such evaluation (Templin and Darley, 1960). These tests usually evaluate the phonemic structure by evoking a single word at a time, either by presenting a picture designed to evoke a given verbal response or by having the examiner present a word orally and then having the subject repeat it. Templin (1947) implies that obtained responses are equivalent whether they are evoked by a picture or by an auditory stimulus. Snow and Milisen (1954*a*) consider mode of evoking a response important, since they find that some children who make articulation errors when the responses are evoked with pictures, respond correctly when the responses are made in imitation of the examiner. Moreover, Snow and Milisen (1954*b*) found that subjects who were able to respond correctly in imitation made more spontaneous progress in articulation development than those who were unable to imitate the sounds correctly.

The distinction of whether a child can imitate a given phoneme when it is presented to him by the examiner may have implications for training. For example, McLean (1965) selected four children who misarticulated a single sound when the word with the sound was evoked by a picture but who could repeat the sound correctly in imitation of the examiner. He demonstrated that it was a relatively easy matter to train the subject to say the sound when the word which included it was evoked with a picture. McLean used standard operant techniques for shifting the response from the control of one stimulus (the vocal stimulus presented by the experimenter) to other stimuli (pictures, printed words, and verbal stimuli). This simple transfer procedure could not have been accomplished if the subject had not already reliably emitted the sound under certain conditions. Thus, training would have had to have been initiated at a different point. Incidentally, McLean demonstrates that two distinct English phonemes may be functional equivalents for retarded children. McLean's subjects all substituted an English phoneme for another when the word including that phoneme was evoked by pictures. After the child received training, the trained phoneme generalized even to words where the originally substituted phoneme was correct. In brief, the subject's language system included only a single phoneme whereas the general English language system included two phonemes.

The expressive phonemic system of normal adults has been well described for normal adult English speaking persons; however, the study of the expressive systems of normal children at various ages is just beginning to undergo linguistic analysis, and the techniques used by linguists have seldom been used to study the language of retarded persons. It is quite likely that such an analysis would give considerable information concerning the phonemic deficits of retarded persons and perhaps would suggest steps for training.

Grammatical productions Berko (1958) has developed a clever technique for studying children's use of morphological rules. Berko uses twenty-seven items to evaluate the child's ability to make the plural and possessive of nouns, the third person singular of verbs, the progressive and the past tense, and the comparative and superlative of adjectives. Berko reasoned that if English words were used to study the morphology of children's language, one could not be sure if the child was acting according to a rule or had simply learned the particular form by having heard it used or by using it. However, by using nonsense items it could be ascertained if, when given the conventional word endings, the child was operating according to rules or making a generalization. An example of Berko's procedure follows. The examiner presented a picture of one birdlike figure, then two. The examiner read the typewritten statement under the pictures. Under the one birdlike figure was the statement, "This is a wug." Under the picture of two birdlike figures was the typewritten statement, "Now there is another one. There are two of them, there are two _____." Preschool children responded "wugs" 75 percent of the time whereas first grade children responded "wugs" 97 percent of the time. Such differences between adults, first grade children, and preschool children are demonstrated on most of the rules evaluated.

Similar experimental techniques could be developed to evaluate children's use of the rules for agreement between verbs, subject nouns, conjunctions, and other grammatical rules.

Grammatical transformations If we take a simple active sentence such as "The boy is hitting the ball," it may be transformed into a negative sentence by the addition of "not" in the proper place. "The boy is not hitting the ball." Moreover, it may be transformed into a question by simply changing the place of the verb "is." "Is the boy hitting the ball?" Finally, it may be transformed into a passive sentence, "The ball is being hit by the boy."

There are several ways to determine the point at which a given child exhibits these transformations. A trained observer might observe the child as he interacts, transcribing each of his verbal utterances and then determining from his transcript whether such transformations occurred and, if so, how frequently. Such a procedure might be quite adequate, but it is an expensive use of a trained person's time and certainly could not be done with large numbers of subjects.

Tape recordings might be made of the child's speech in a variety of situations, and then the recordings could be evaluated for the presence or absence of such transformations. Thus, the observer would not have to follow the child around, and a permanent record of the child's utterances would be recorded so that interobserver reliability of transformation ratings could be made easily. Once again, however, the procedure is quite time consuming.

Another procedure involves developing specific stimuli or test items designed to check the presence or absence of transformations in much the same way that Berko developed items to check morphology. For example, if negative transformation were being tested, two pictures might be presented to the child, one which exhibited a particular attribute and one which did not. Suppose there were two pictures of light bulbs, one which was broken and one which was not. The examiner would say, "This light bulb is ____." A highly probable response for a child who uses the negative transformation would be "not broken." Other items could be developed to test other transformations. The specific tests for transformations have the advantage of sampling and evaluating a specific aspect of language quickly and efficiently. However, it has the disadvantage of sampling the behavior in a limited and somewhat artificial context which may not be completely related to the child's use of language in communication. Moreover, there is some problem in creating items which are adequate to sample such transformations as the interrogative.

A final method of evaluating a child's transformation is simply to have the examiner read the various transformations and have the child repeat them. This is the simplest procedure and has the highest probability of evoking the specific transformation. However, there is no clear evidence concerning the relationship between transformations evoked in this manner and those obtained by the procedures listed above. Nevertheless, if we ask institutionalized retarded children to repeat the various transformations, we cannot help but be impressed by the inability of many of the children to repeat even the simplest transformation. For example, when the examiner says, "Is the boy running?" the child frequently repeats, "The boy is running."

Referential of semantic control over vocal behavior Many of the procedures mentioned above indirectly involve the semantic or referential system. However, more direct tests of the meaning of a person's language can be made. Meaning, as used in this chapter, refers to the variables which control a given verbal response or, stated another way, the context in which the response occurs. The contextual or controlling variables may be either verbal or nonverbal. Skinner (1957) has made a rather careful analysis of the variables which control verbal behavior. When the variables evoke rather similar responses in many persons in the community, the evoked responses are said to have similar meanings. Numerous procedures have been developed to evaluate a person's expressive referential system. Perhaps the simplest way of evaluating the person's referential system is simply to show him a series of pictures or objects designed to evoke a specific response. The tact subtest of the PLS and numerous items of the Stanford Binet Test (Terman and Merrill, 1937) are of this type. This type of item yields information concerning whether an individual names objects in a similar manner to other members of his community; however, such items are usually not designed to evaluate the more subtle aspects of the subject's referential system, such as terms referring to relationships or abstractions. Items could also be developed which would evaluate the subject's referential system for responding to relationships and abstractions. Many of the plates of the PPVT would be excellent for evoking verbal behavior referring to abstraction and relations.

An additional procedure would be simply to have the subject describe a picture scene and develop a system for scoring referential behavior. Such a procedure would be complex, but it would allow the examiner to evaluate a wide variety of characteristics of the subject's referential system.

Finally, techniques could be developed for testing the speaker's referential system using a listener who performs some task, as is the case with the experimental procedures of Rosenberg and Cohen (1964) and Kraus and Weinheimer (1964).

SUMMARY AND CONCLUSIONS

The discussion of language evaluation procedures was based on two assumptions: (*a*) that the goal of language evaluation was to aid in making decisions concerning language training or therapy and (*b*) that the goal of language training was to establish for the retardate a language repertoire which will allow him to communicate with normal persons. It was suggested that persons engaged in developing language therapy programs first look at the language of normal persons in natural situations in order to establish the goals of the program. Once the goals were established, the language of children would be studied to provide hints concerning appropriate intermediate steps of a language training program. The language evaluation techniques would be based on the language program and would be aimed at evaluating prerequisite language behavior. Thus, evaluations could be used to determine the stage at which a child should begin a language program.

The advantages and limitations of a number of such evaluation techniques were considered. The evaluations include observations and recordings made by observers in the natural settings, observations and recordings made from films or tapes, standard test procedures, and instrumented techniques. It was concluded that as we went from the observation in natural situations to instrumented recording, our sample becomes increasingly more restricted but that our data become more precise and replicable.

Specific techniques were suggested for evaluating and training both receptive and expressive language processes.

Finally, I would like to suggest that no single section could begin to sketch either the terminal behavior or the desired steps in a language training program and its concomitant evaluation procedures. These will come only from long intense work by those engaged in developing language training programs. Such programs will inevitably involve a tremendous amount of shaping through trial and error.

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CHAPTER 9

ISSUES FOR SPEECH AND LANGUAGE TRAINING OF THE MENTALLY RETARDED

Bernard B. Schlanger

The mentally retarded for the most part are delayed in developing linguistic functions such as generalization, association, discrimination, and manipulation of verbal concepts. Additional observations of the retarded drawn from the literature and from experience reveal a number of negative characteristics which presumably affect language functioning. These characteristics include:

1. Poor auditory retention span (auditory memory),
2. Short attention span developed through negative training and/or inherent in the biological mechanism,
3. Linguistic ability deficient as demonstrated by poor grammar and minimal content,
4. Perseverance in oral expression,

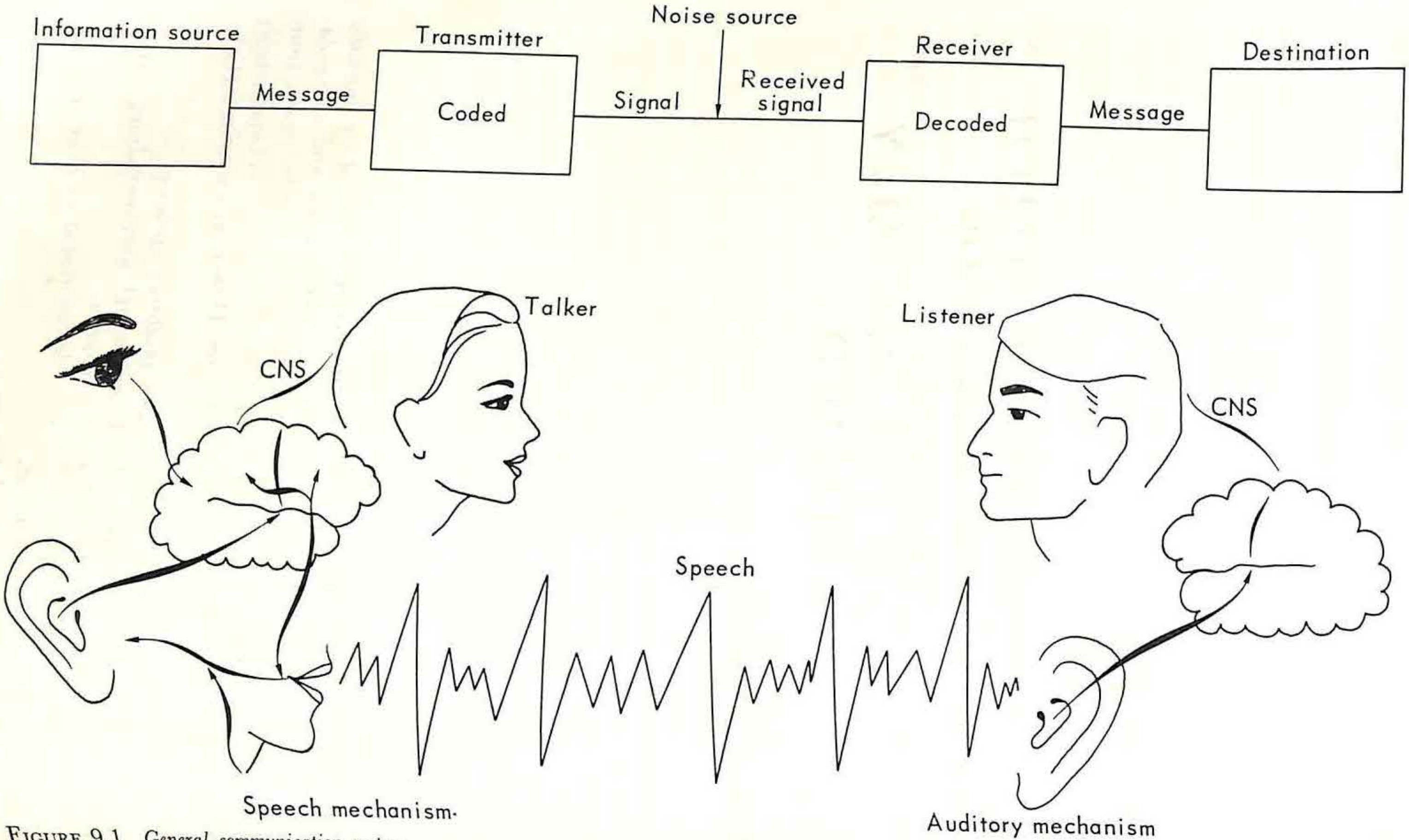

FIGURE 9.1 *General communication system.*

5. Minimal creative or imaginative pursuits,
6. Inability to transfer meanings,
7. Absence of self-criticism,
8. Poor evaluation and organization of perceptual clues, and
9. Frustration in communication activities leading to withdrawal and lowered thresholds of frustration.

Many of the above observations appear to be learned expressive communication behavior; many are also concerned with receptive communication.

The inappropriate social responses and self-stimulation (interpersonal and intrapersonal feedback) of the retardate are associated with his limited communicative skills. This linguistic deficiency serves additionally to stigmatize the mentally retarded and to strengthen the concept which typically relates inadequate speech and language use with mental retardation. The retarded are treated as a minority group and are subjected to prejudices and discriminations by both lay and professional groups. The concept that defective communication *results* from mental retardation is typical of the negative attitudes of many examiners, particularly those in the speech and hearing profession. We find these specialists overlooking (*a*) the dynamic aspects of human behavior, (*b*) the diversity of this behavior, and (*c*) the idea that causality works in both directions, that is, that poor learned communication habits may further depress the learning abilities and the self-evaluation of the mental retardate. In a given communication training program, the attitude of the therapist may be as much in need of reorganization as are the communication habits of the subjects.

Communication is not a global acquisition nor a global development, but it may be divided into parts as indicated in models such as those by Osgood (1963) for normal communication and by Wepman (1960) for the aphasic.

Fairbanks (1954) has offered a communication model based on engineering principles which can be used for illustrating the source of the problem. The general communication system which is unidirectional appears in Figure 9.1.

The noise source is not necessarily restricted to the area indicated, but may originate in any part of the system and affect the functioning of the entire system. This is undesirable as it modifies and interferes with the entire message. An engineer can identify the source of the noise and make suitable adjustments in his apparatus for eliminating this interference.

The speaker-listener model follows this mechanical arrangement in assigning production (expression) and perception and translation of messages into meaning. This communication paradigm is indicated in Figure 9.2.

The message originates in the brain, the information source. The energy initiated by the respiratory system, the phonation generated at the larynx,

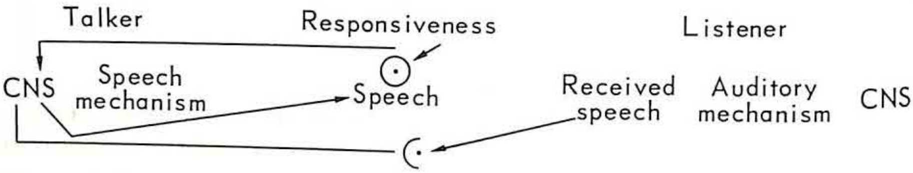

FIGURE 9.2 *Speaker-listener model relationship.*

the amplification and shaping of the sound by resonators and articulators are all parts of the integrated system that can go awry. First the monitoring ear indicates this through self-observation of the coded signal. Second, this feedback is augmented by viewing results of the message on the listener. Poor muscle coordination, pathological or functional defects of the palate, and severe malocclusions are among the possible causal elements disrupting proprioceptive feedback, a third method of detecting our own "noise" sources. The precipitating elements of the speech and language malfunctioning may be any one, or combination, of several deviant elements along a speech chain involving *either the talker, the listener, or both.* Certainly the communicative problems should not be grossly stated as "delayed speech and language caused by mental retardation." This is over-simplification and tends to bias any efforts to ameliorate the communication problem. See Figure 9.3.

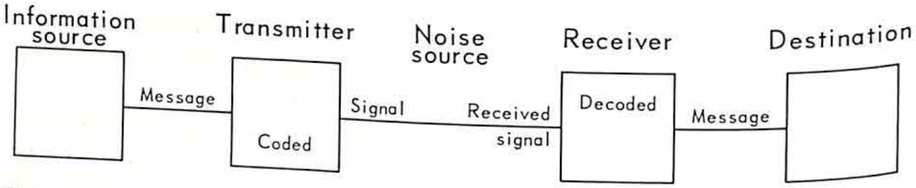

FIGURE 9.3 *Fairbanks general communication system.*

The analogy of the mechanical and human communication systems can be accepted if we understand that the human communicative activities are (*a*) reversible with the talker becoming a listener, (*b*) self-reflexive in that the speaker is aware of his output through feedback, and (*c*) adjustive in that the speaker may make changes based on self-evaluation. As stated above, not only is the speaker aware of his output through auditory feedback, but also he receives proprioceptive feedback from his motor-speech mechanism and visual feedback from the listener. "Noise" may originate in any part of the model and in many instances may be self-adjustable. Among the retarded, "noise" is multiple and may occur in many parts of the model. The original source of the deficit might very well be genetic or organic or both, affecting particularly the early language learning of the child. Nevertheless, the verbalization may become better adjusted or be adjusted later as a function of the environment with its subtle and not so subtle rewards and punishments. And as the Parsons Project[1] experiments have indicated, the environment also changes in terms of responses or lack of responses received from the communicator.

Conscious application of the above communication model changes stress from the verbal production or "talker" aspects of communication to at least an equal stress on the listener role. It also focuses on the feedback of the communicator and the reinforcement he receives from the listener. Rather than a communicative dichotomy, we might think in terms of a holistic concept. Listening controls a person's output and is used constantly. Certainly it deserves more attention. The model focuses on specific departures from the norm, for example, hearing impairment or dysarthria. Not only should primary causes for communication difficulties be ascertained, but the potential maximum achievement of all parts of the model should be judiciously considered. As development occurs, language operates at various levels of efficiency, dependent as it is on organic completeness and social, emotional, and intellectual factors. The output may vary from nonmeaningful babbling and jargon through various gradations of meaningfulness. One way to study the listener or feedback aspects is to evaluate the "noise" interfering with the transmission or reception of the code (diagnose). We can also seek to prognose the adaptation of the mechanism to both "noise" and code, estimating the potential level of communicative functioning. Any therapy model has to take into consideration the multidimensional and dynamic aspects of communication.

The goal for each person is the attainment of the maximal physical and intellectual functioning of which his organism is capable. We weigh the retarded subject's abilities as well as his disabilities. Also, in order to improve communication we need to consider such variables as (*a*) the attitudes and training of the therapist, (*b*) the setting, whether institutional, special class, or regular class, (*c*) the authority figures in the environment, and (*d*) the cultural surroundings.

With these variables in mind, the therapy program might utilize such obvious broad learning principles as described in the following outline (obvious and yet so often neglected in speech and language training of the retarded).

1. *Start at the subject's level of language development, that is, where he is in terms of listening and expressive behavior.*

If the subject does not appear to listen well (with no hearing loss noted), there should be progression from relatively unstructured activities to practices that are controlled and practical in communication. These might include such activities as:

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[1] Parsons Project in Language and Communication of Mentally Retarded Children, Parsons, Kansas.

a. Awareness of sounds through use of toy objects, records, and noise makers.

b. Association of sounds with objects.

c. Localization practice.

d. Movement in response to sound for control.

e. Sound pattern imitation.

f. Discrimination practice.

g. Activity to music.

h. Story telling (with maintenance of good eye contact).

2. *Use of reward as a reinforcer.*

Praise, smiles, and food individually or together are given at appropriate responses. There has to be a pleasurable social atmosphere with absence of tension. This may be the major reinforcer.

3. *Since learning is slow and considerable repetition is necessary, variety within a structured program is needed.*

Variety may be achieved by reading a story and adapting it to the linguistic abilities of the subject. It can be played back by tape recorder or, if available, on professional recordings. Puppets created by the subjects may re-enact the story. Other methods utilize coloring characters and scenes and using flannel board portrayal, which teach event sequences. The lack of creative activities in programs with the mentally retarded frequently leads to perseveration of ideas and actions, with the familiar word or phrase being used constantly by the subjects only in order to ingratiate themselves.

4. *Activities should be meaningful.*

Role playing adapted to current and possible future experiences may be used. In school situations various problems can be discussed and played with each student assuming different roles. Job interview techniques with placeable retarded adults are used. Real experiences can be preceded with practice in talking to teachers, policemen, postmen, sales people, and the like.

5. *Therapy needs forward progress and action.*

Programming must move from unstructured to structured, simple to less simple, from nonmeaningful to meaningful, from the word to a phrase. Progress should be rewarded by "tokens" such as stars, poker chips, candy, and other rewards.

6. *There must be some understanding by the subject of what he is expected to learn.*

Because of the lack of insight in many of the mentally retarded, this is not an easy task. When not working directively on good communication attitudes and responsiveness, the goals have to be suggestive.

7. *Direct therapy on sound for the more able.*

In addition direct therapy might include such activities as ear training practice, muscle control and speed drills, and sound and word drills. The last activity is indicated for the higher grade retarded subject if other aspects of communication besides the phonetic are adequately mastered. For most of the mentally retarded, language activities are suggested.

Questions concerning some of the variables encountered and unanswered in speech and language therapy with the mentally retarded can be posed under the following several issues.

Issue A. Does the therapist working with the retarded need special characteristics or training?

1. How may the work be made more attractive in order to hire the most skilled therapist?
2. How may the speech and hearing therapist be made more aware of the area? Does he need special talents or sophistication?
3. Would he be a more worthwhile contributor if he could structure a communication program for groups of children instead of working with the individual child?
4. Should he search for the "noise" element in communication or concentrate on observable behavior and attempt to modify it?

Issue B. On what criteria should mentally retarded subjects be selected for therapy? Where and how?

1. Should the concentration be on the noninstitutionalized, who constitute the bulk of the population and usually are free of demonstrable neurophysiological defects?
2. Is there an institutional effect based either on the environment or selection of candidates for institutionalization which should be recognized in this selection?

Issue C. What are the best preliminary approaches to therapy?

1. How intensively and for how long a period should therapy be planned?
2. Should stress be placed on the phonetic or on the linguistic activities of communication?
3. Should therapy aim at constant evaluation (diagnostic therapy) or prognostic therapy (programming method trials)?
4. Is the maintenance of the *status quo* sufficient justification for therapy with the mentally retarded?
5. Can one model of speech and language therapy be sufficiently broad to cover all levels and types of mentally retarded subjects, or is it necessary to consider several approaches?
6. Since causes may be so many and so varied, should the therapist bypass the onset of the condition (differential diagnosis) and ask:
   - *a.* How is the subject using communication to adjust to life situations?
   - *b.* Does he appear not to be using his full capacity?

Issue D. What therapy procedures should be used?

1. How much emphasis should be placed on listening training?
2. What activities can be considered rewarding and have strong reinforcing properties?
3. Is a great variety of activities needed in therapy with the retarded, or is boredom achieved early in repeating activities of which there is little understanding?

4. How can awareness and utilization of feedback be taught? Can the monitoring of the retarded subject's voice and speech by delayed feedback motivate him to be aware constantly of his output?

5. By what associative means can word meanings be taught? Is it by class categories, synonyms, and opposites? How can the content vocabulary be organized into accepted language structure, including function words as well as content words?

6. What are the effects on communication of a restrictive, as compared to a permissive, environment?

7. After poor habits of communication which are socioculturally derived appear stabilized, is it possible to effect change in phonemic, syntactic, suprasegmental, and other linguistic factors?

8. If special class curricula placed greater emphasis on oral communication under the control of the therapist trained in oral activities, would this be sufficient to reach the communication potential of many of the retarded?

9. Does group therapy offer a more stimulating milieu than individual therapy? If communication interaction is one of the goals desired, can this be achieved by selective grouping?

10. Can the parent or other authority figures carry through a therapy program, or are there too many negative reinforcements associated with them? Would direct participation in a therapy program by both the mentally retarded child and his parents enable positive communication relationships to be established?

11. At what level of retardation can direct therapy be used?

12. What is the ultimate effect of enrichment language programs on the communication skills of the preschool retarded child?

Issue E. What is success in therapy with the retarded, and how is it measured?

1. Which of the following could be considered immediate attainable goals, and how can they be measured?

a. A change in attitude toward communication.

b. Improvement in quantitative language measures.

c. Improvement in measures assessing quality of language.

d. Expectation of failure reduced.

e. Augmented ego strength or improvement in self-concept.

f. Attainment of insight into the communication problems and an understanding of the means by which these might be adjusted.

2. How many trials or how long a period of communication interaction can be justified? Can this be assessed best by direct measures such as word counts, developmental language scales, levels of abstraction, psycholinguistic measures?

Issue F. Are there nontraditional therapy methods that should be explored?

1. The multisensory approach to learning has a long and honorable history in the teaching of the retarded. Work in recent years has suggested a reduction of stimuli. Would the unimodality approach, auditory or visual with proper reinforcement, prove better than multimodality treatment?

Which of the various avenues offers the best channel in obtaining improved responses? How can this be ascertained?

2. Imagery needs reinvestigation. In what way does the retarded individual respond to a word or picture? How can his response to an object, word, or picture be meaningfully ascertained? Would therapy along the channel of his determined image response prove efficacious?

3. Can self-administered programmed devices using sound and picture sequences be operated by the mentally retarded to improve communication? Can the attention span be improved through machine programs? Is the machine less threatening to the retarded than a therapist?

4. Does the use of the retarded's own sounds motivate him as much as those of the therapist in various feedback operations?

5. Can the massed listening booth practices used in teaching foreign languages be adapted for use in improving the communication of the retarded? Would combining the taped lesson with projected slides prove to be better therapy material than either medium alone?

6. Would practice in delaying a verbal response improve that response? What would be the effect of varying the delay which would be contingent on either a verbal or nonverbal signal?

7. In a unimodality approach, namely auditory, are there specific methods within the channel that need exploring to refine even more the approach through ability structure?

The negative evaluation of the mentally retarded is based on a descriptive term which in many minds implies a static condition. Progression from early sensory-motor behavior to symbol behavior is on a continuum and needs to be investigated from all aspects of development. Any child who has lived in a communicating world and has difficulties listening and talking (and monitoring) represents a complex problem that is not resolved by the application of nomenclature. The important question is not what happened. Rather, the emphasis and concern should be What communication goals are within the retarded child's reach? How may improved communication be best attained and how would this affect other learning behavior?

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CHAPTER 10

LANGUAGE TRAINING FOR MENTALLY RETARDED CHILDREN

Sylvia O. Richardson

It is pointed out that few studies have related conceptual language approaches to mental retardation. The reports that describe current language programs do not clearly delineate the children being treated, thereby weakening these programs' usefulness as models. Only rare mention is made of the preschool population or the value of preverbal experience in language programs for retarded children.

The majority of mentally retarded children have the potential for attaining some degree of independence and self-sufficiency on reaching adulthood. The actual level of self-sufficiency obtained depends largely on the nature of the training provided during the earliest formative years. Because it is my firm conviction that the core of this training is in language and its antecedent developmental determinants, I have chosen to look at a few studies relating to some of these determinants and will attempt to relate the findings to a system which has been found useful in planning a language program for the young retarded child.

RESEARCH

If Piaget's (1951) observations are correct, spoken language—that is, the motor side of a language skill—comes only after images, or the central processes representing objects and events, have been developed out of repeated encounters with those objects and events. For example, O. K. Moore of Yale notes that when preschool children have learned to recognize letters by repeatedly pressing the proper keys of a typewriter, they discover spontaneously that they can draw these letters with chalk on a blackboard; this lends support to the image primacy thesis. Moreover, Moore has observed that these four year olds who have presumably acquired solid imagery of the letters in the course of their experience with the electric typewriter show muscular control which corresponds to that of older children.

Piaget (1952) has conceived of looking and listening, both of which are typically viewed as sensory input channels, as existing among the schemata ready made at birth. He attributes to looking and listening key importance during the first phases of what Hunt (1961) calls the epigenetic process of intellectual development. The existence of an epigenesis of intellectual functions implies that the experiential roots of a given schema will lie in antecedent activities that may be quite different in structure from the schema to be observed and measured (Hunt, 1961). Thus, although early practice at tower building or buttoning may be relatively unimportant for the later development of skill in these particular activities, an unhampered antecedent opportunity to throw objects and to manipulate them in a variety of situations and an even earlier opportunity to have seen a variety of sights and to have heard a variety of sounds may be of tremendous importance in determining both the age at which tower building and buttoning will occur and the degree of skill that the child will manifest.

Hebb (1949) believes that the basis for primary learning is chiefly sensory. According to Hebb's theory, firing systems, which he terms "cell assemblies" and "phase sequences," must be built into the brain through what he calls "primary learning." This may be another way to say that the brain must be programmed properly by preverbal experience if the individual is to function effectively as a problem solver. Hebb assumes that most of this "primary learning" is based upon early perceptual experience. This concept led Hebb (1947) to compare the problem-solving ability in adult rats having had their perceptual experience limited by cage rearing with that of rats having had their perceptual experience enriched by pet rearing. The problem-solving ability of the cage-reared rats was inferior to that of the pet-reared rats.

Dennis (1940) observed the effects that Hopi Indian cradling practices and the effects that auditory and visual stimulation have on the age when children begin to walk. In two groups of Hopi Indian children he found that although the cradling practice inhibits action of an infant's legs and arms during his first year of life, the mean and standard deviation of the age of walking for those cradled proved to be the same as the mean and standard deviation for those Hopi children reared with free use of their legs and arms. In a Teheran orphange described by Dennis (1960), the children had no restrictions on the motor function of their legs and arms, but 60 percent of the two year olds were not sitting up alone, and 85 percent of the four year olds were not walking alone. The orphans were subjected to a continuous homogeneity of auditory and visual experience. But the Hopi children reared by the cradling practice, by being carried around on their mothers' backs, were exposed to a rich variety of auditory and visual stimulation.

Evidently, having a variety of sensory experiences (things to listen to and look at) is highly important for development during the earliest years of life, especially the first. There appears to be considerable evidence to confirm the supposition that the basis for primary learning is chiefly sensory rather than motor. This must be considered in any discussion of the developmental determinants of language skills. Infants and young children must be exposed to experiences which promote the development of those central processes that are necessary for acquiring skill in the use of linguistic symbols and for the analysis of causal relationships.

The Russians are doing fundamental work which is of interest. Berlyne (1963), in a report on current Soviet research on intellectual processes in children, points out

> There are in the world today three bodies of work on child psychology, each of about equal volume as far as empirical data and theoretical ideas are concerned. These are the literature in English, the literature in Russian, and the literature in French. The literature in French includes Piaget's work which, in sheer quantity, is about equal to all the English-language or all the Russian-language literature put together. In other words, if we confine ourselves to English-language literature in child psychology, we are confining ourselves to about a third of the literature of child psychology. If we further restrict ourselves to English-language literature on intellectual processes in children, we shall probably have access to considerably less than a third of the significant work.

It might be useful to include a review of some of the less familiar Soviet research. The two major currents in Soviet child psychology can be traced back to Pavlov and Vygotsky. Berlyne (1963) states: "Toward the end of his life, Pavlov had reservations about the scope of his conditioning principles as applied to human beings." His later writings referred to what he called the "second signal system, the portion of the nervous system concerned with verbal behavior." The second signal system enables us to respond to words as "signals of signals."

> Just as a light, an initially indifferent stimulus, may act as a signal for the impending appearance of food, the word *light* becomes a signal for the light. . . . A verbal stimulus affecting the second signal does not, in general, stand for one particular stimulus of the first signal system; it stands for a whole class of non-verbal stimuli with a certain property, or set of properties, in common. The second signal system thus makes possible high levels of abstraction.

Quite a few of Pavlov's students have been working on this second signal system, for which children are particularly appropriate subjects. Berlyne (1963) describes the process.

> The apparatus consists of a device for producing stimuli such as sounds or colored lights, a rubber bulb that can be held in the subject's hand, and a kymograph or some such equipment to record the duration of the stimuli and any pressure exerted by the subject's hand on the bulb. The experimenter produces the conditioned stimulus, say a red light. Then he says the word, "Press" (the unconditioned stimulus), and the child presses. After a few trials, a conditioned response develops: the child begins to press the bulb during the CS-US interval (i.e., when the red light alone comes on and before the E has time to say, "Press").

Many variations can be utilized, and all the standard Pavlovian phenomena have been demonstrated with this technique.

Once the procedure is established, technique may be changed (Dmitriev, 1962) so that there are four possibilities: red or green light in combination with press or no press. No new directions are given, but following the response in each case, the examiner says something reinforcing. If the child presses to the red light (positive) or does not press to the green light (negative), the experimenter may say, "Correct." If the subject presses when he is not supposed to, then the experimenter may say, "You shouldn't have pressed." Similarly, if the subject fails to press within an appropriate interval after a red light, then the experimenter says, "You were supposed to press," or "You should have pressed." Essentially this technique involves changing from classical conditioning to reinforcement for the correct response by saying, "Correct" after the performance of the response. It also seems to be more of an experiment on thinking than on conditioning. It is a test of how well the child can figure out when to press and when not to, that is, how to figure out the rules of the game.

Marked differences have been found between older and younger children. In children from about five to six years old this kind of discrimination seems to be established very quickly after only a few trials. The three year olds take time to build up the discrimination. At first they respond to both lights; then very gradually the response to the negative stimulus disappears, exactly as with salivary conditioning in the dog. Reversal training takes some time, and conditioning seems to be very unstable. Occasionally the younger children will miss a response just as a dog will.

The conclusion drawn from this is that in an older child the process is being controlled by the second signal system, whereas in the younger child it is not. The Soviet investigators interpret the behavior of the younger child as building up typical classically conditioned responses to the lights, whereas the older child is using inner language as a "mediating response" (Osgood, 1952). As Berlyne states, "He is reacting to the light with internal verbal responses that amount to self-instruction, and he is reacting to the self-instructions with a pressing response."

Vygotsky (1939) distinguished the role of speech in affecting the behavior of other people from its role as a means of affecting one's own behavior. Vygotsky said that the properties and structure of inner speech and outer speech are different. The child first allows his behavior to be directed by the speech of others, and much later he uses speech to direct his own behavior as a by-product of his responsiveness to what others have said to him. Vygotsky's work led to much experimentation on relations between thought and language and on ways in which both thought and language regulate overt behavior. Of those who belong to his school, Luria is probably the best known in this country.

Luria (1959; 1960) found that words have different ways of influencing a child's behavior at different ages. When the child is from one and a half to two years of age he demonstrates an *orienting* response to language, the words serving primarily to attract or gain his attention. At a later stage, verbal instruction seems to have the primary effect of simply making the child do what he was already going to do, which Luria calls an *impulsive* or *releasing* function. Next, language acquires a *selective* function as the child responds by obeying simple commands.

The most advanced function of language described by Luria (1959) is that of *preselection*, which may be described as self-instruction. The two-and-a-half year old will obey a simple command such as "Press the bulb when the red light comes on," although he will not wait for the light; in fact, when the light comes on he may stop pressing because of external inhibition. The three year old will probably wait for the red light to come on, but he will not be able to handle a discrimination such as "Press the bulb if a red light comes on, but do not press if a green light comes on." Not until the child is five and a half or six years of age will he be able to solve both parts of this discrimination. Now he can withhold a response or respond appropriately in accordance with a set produced by previous instruction.

Soviet research on learning and perception in children also emphasizes the relation of motor movements to perception. A developmental study of eye movements and hand movements in the perception and recognition of form was carried on under the direction of A. V. Zaporozhets (Berlyne, 1963). In general, it was found that with respect to orientation, there seems to be a strong common trend between the kinds of eye movement and the kinds of hand movement that occur. If a new stimulus is presented visually, there are wide, sweeping eye movements which seem to have the function first of fixing the stimulus in space and then exploring around it. Finally there is a more detailed exploration by smaller movements around the contour and within the contour of the object. The same sequence is found for hand movements when an object is explored tactually.

It is interesting to note that children who were given a task of visual identification "seemed to be compelled to trace out the contours with their fingers in the air" (Pick, 1963). When a form was projected on a screen and very young children were asked to match the form from a group of three figures placed in front of them, they would spontaneously trace the projected form with their finger but could succeed at the task only if they also traced the contours of the figures before them. The interpretation was made that for young children, feedback from exploratory movements is essential in a recognition task. Also, in many of the studies on perception "it has been found that training facilitates discrimination, but only when it involves motor mediation" (Pick, 1963).

Parenthetically, the idea of a mediating response as the unit of thinking and intellectual functioning seems to have appeared in several different places at once. In this country we stress the importance of the implicit verbal response; Piaget stresses the implicit executive responses, responses that act to modify the environment; and, although the Russians acknowledge the importance of the verbal response as a result of their interest in Pavlov's second signal system, they give major prominence to the orienting responses, which they relate to the functions of attention.

Zaporozhets, a student of Vygotsky, suggests that the essence of voluntary behavior is in feedback (Berlyne, 1963). He points out that there is a difference between primitive behavior and complex voluntary behavior with respect to how much feedback occurs and at what stages, and he feels that in order to achieve the stage of voluntary behavior we must be able to receive feedback en route. Zaporozhets combines emphasis on orienting reactions (the objective equivalent of a conscious attentive process) and this emphasis on feedback in order to evolve a theory of the nature and development of voluntary action in the child. His experiments involve various motor tasks such as pushing a toy car around the correct path in a maze, knocking in a nail with a hammer, and performing gymnastic exercises. Berlyne (1963) summarizes Zaporozhets work by saying,

> The interesting finding that emerges from these numerous experiments is that verbal instruction and imitation are much more effective if they are directed toward orienting responses, as well as executive responses. In other words, in teaching a child how to carry out a complex task, one must make sure that he is also taught how to organize his orienting responses. He must learn what to look at; his attention must be directed to the right cues, both external and proprioceptive. He must make use of feedback from both the external situation and from his own actions and the experimenter must train him to do this. Several experiments show that the time to learn a task can be cut down if orienting behavior is specifically trained.

This might come under the classification of "what every good teacher knows," but it is not always put into practice.

APPLICATIONS

Most descriptions of language training programs for retarded children are fairly general. However, the majority stress the need for repetition, for presentation of concrete material and the use of visual aids, the importance of "readiness" activities antecedent to speech training, sensory training, emphasis on looking and listening before speaking, training in motor skills directed toward improving coordination, and so forth. This approach is clearly defined by Donovan (1957) in relation to a speech program for mentally retarded children in the public schools of New York City. However, the reasons why many of these techniques are used often are obscure or stereotyped.

At present, as Bernard Schlanger has pointed out, the usual criterion for the selection of "worthwhile" cases for therapy is the child's ability to achieve a certain educational level, as represented by the intelligence quotient. This is in spite of the generally acknowledged fact that the IQ is overemphasized. A minimum mental age from four to six years of age and functioning in the educable range is often suggested as the optimal time to begin speech therapy. Yet the normal child usually begins to talk somewhere between twelve and eighteen months during the height of the period of sensory-motor learning. Why must the retarded child be put off? It appears that we might well examine some applications of such "theorizing" discussed earlier in order to develop more fruitful language programs for mentally retarded children.

For present purposes, we have skimmed over some of the research on language and thinking which demonstrates that:

1. Early exposure to a variety of experiences in looking and listening is important in language development.
2. Perceptual and preverbal experiences are requisite in primary learning.
3. Motor movements are closely related to perceptual development.
4. There is a need for the development of motor patterns as well as perceptual patterns in language development.
5. The orienting response (attention) is an important source of internal mediators and can be trained.
6. Linguistic labels are also mediating processes in learning.
7. Language development is part of and a result of primary learning.

At this point I should like to present some techniques that we have found useful in teaching retarded children, especially with regard to language development. These techniques are related to the research findings mentioned above. Possibly we can weave these into a rough fabric in order to discern a definite pattern.

The Child Study Center,[1] which is part of the Department of Pediatrics at the University of Oklahoma School of Medicine, is an evaluation center for children who are considered to be mentally retarded. One of its functions is an evaluation day nursery for diagnostic therapy, where some retarded children also are enrolled for extended periods of time. The majority of youngsters in the nursery have little or no speech on admission. The age range is from about three and a half to eight years, and the group is quite heterogeneous, particularly with respect to etiology. No child is admitted who is not functioning at the level of at least a one-and-a-half to two year old. None have major neuromotor involvement or would qualify easily as "cerebral palsy." No more than sixteen children are admitted, and the most "comfortable" number is twelve. The nursery directress is a speech pathologist, as well as a trained Montessori teacher and has a good background in special education. She is assisted by volunteers who have been specially trained.

Regardless of etiology or classification, most of the preschool nonverbal children in the nursery manifest various signs of neurological dysfunction, including intellectual or developmental subnormality. Although the peripheral sense organs function adequately, sensory-motor development is obviously inadequate, the functions of attention and perception are impaired, and behavior is characterized by disorganization.

Language training for any child must begin with training of preverbal skills, the antecedents of language and speaking. We refer now to the theories of Piaget, Hunt, and Hebb as discussed earlier. In normal development, the baby must possess a psychic life antecedent to his life of motion. Through his senses he actively absorbs images of his environment for some time before he begins to express himself through motor activity. In order to orient himself in his world, he must perceive the environment as a whole with interdependent parts. If he perceived only separate objects and not their relationships within the whole, he would be in chaotic confusion. He must also develop an inner orientation which gives him a sense of the parts of his body, their movements, and position. This inner orientation, or body image, and the outer orientation that is concerned with relationships between the parts of the environment and the relation of the environment to himself eventually result from looking, listening, touching, and moving, all of which are experiential roots or antecedents of language and speaking. The output will be a reflection of the way in which the organism has been able to integrate the sensory input.

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In order to assist the child in his task of orientation, his environment should be made pleasant, simple, and orderly in structure. The materials in our nursery are designed to attract his attention, to "educate the senses," and to allow manipulation by the child. Our goal is to assist him in his task of creating order in sensory input by presenting a carefully constructed sequence of experience which proceeds slowly, often painfully so for the teacher, from the concrete to the abstract.

Because of the perceptual-motor disorders exhibited by the children, emphasis is on training the motor bases of behavior (Kephart, 1960) such as posture, the development of laterality and directionality, and the development of body image; training in perceptual skills such as form perception, space discrimination, stereognosis, recognition of texture, size, and structure; training in auditory perception (listening), in visual perception (looking), and in kinesthetic perception (muscular memory of movements, positions, and postures). (Refer to Piaget and Hebb concerning image primacy and primary learning.)

Montessori (1912) materials and techniques are used in the nursery because they are eminently well suited to the goals of training. They were originally designed for retarded children. The nursery directress is trained in the Montessori method since the materials are of little value unless they are used correctly. The Montessori materials are grouped according to the purpose for which they are to be used: materials for learning self-care and care of the environment, those specifically for sensory and perceptual training, those to prepare the child for and to instruct him in writing and reading, and the mathematical materials. The sensorial materials are auto-educational in that the child can discern his errors in the use of the material without needing the teacher to tell him he is wrong. The material controls every error. Or we might say that reinforcement is built in, as in the modern teaching machine. Of further value, the sensorial materials are graded in simple logically progressive steps which lead the child indirectly but securely into the language and mathematical apparatus. Montessori's approach to education, originated almost three quarters of a century ago, is based on the thesis that one of the bases for primary learning is sensory. She also taught that motor mediation is imperative for the young learner, although she used different terminology: ". . . the hand is the child's teacher."

Lest the reader assume more than is intended from the above, although these materials provoke auto-education in the normal child, these techniques merely make education possible for the retarded. We have found that it is often necessary with the retarded child to recall his attention continuously and actively, inviting him to reexamine the material and to show him the various pieces. When the retarded child commits an error, it is usually necessary to correct it or to urge him to correct it himself. The teacher must become much more actively involved with these youngsters than with normal children.

In the Study Center Nursery, *muscular education* exercises are chosen which tend to aid the development of physiological movements, such as walking and breathing. Climbing exercises and parallel bars for swinging are used, since in the earlier years the child's arms are relatively much stronger than the legs. There are also the usual games such as listening and marching to music, playing with balls, beanbags, and swings.

The children especially like Montessori's game, Walking the Line, where they learn to walk heel-to-toe along a line about 2 inches wide. Examples of these exercises in balance, posture, and control of movement are as follows:

1. Walking on a line—feet in correct position.
2. Walking on a line—feet in correct position and hands by sides.
3. Walking on a line—feet in correct position, hands by sides, and head erect.
4. Walking on a line—feet in correct position, hands by sides, head erect, and a flag in one hand.
5. Walking on a line—feet in correct position and carrying a tray with a solid object on it.
6. Walking on a line—feet in correct position and carrying a tray with a tumbler or a glass on it.

In order to assist development of independent function, Montessori provides *Exercises of Practical Life.* These exercises utilize materials that are found normally in the child's environment and provide practice in the care of the environment, as well as activities of coordination.

Of importance, as the child is taught each activity (such as washing hands or polishing shoes), each step of the operation is presented in logical orderly sequence, almost as one would program a computer. (Refer to Hebb on primary learning and the Soviet stress on the conditioned response in the young child prior to the later control by the second signal system.) The child is trained to focus attention (orientation response) and to analyze each of his body movements as he repeats the sequence each time. Improvement of each step within an activity leads to a gradual decrease in clumsiness and extraneous activity. The method of presenting each step of these exercises to the child is based on the same type of premise proposed by Zaporozhets with regard to the need for receiving feedback en route in order to achieve complex voluntary behavior. The Montessori directress is trained to lead the child's attention to each external and proprioceptive cue. When she goes over each step of an exercise, such as washing the hands, verbalizing each action as it is performed, the child learns what to look at. He is being trained to use feedback from his own action and from the external situation.

It is fascinating to watch some of the most hyperkinetic and disorganized children begin to quiet down and to concentrate as they learn to exercise their motor drive in directed and purposeful activity. Experiences seem to be taken in through the senses, and the child works out meaning through his activity. The children will repeat these "practical exercises" over and over again in a kind of perpetual motion even though they may show no progress in speed or skill for a long period of time. Learning requires concentration, and the only way a child can concentrate is by fixing his attention on a task he is performing with his hands. It has also been noted that the more accurately an exercise can be taught in all its details the more it seems to become a stimulus to much repetition (not perseveration but purposeful repetition) of the same exercise. Using this method with retarded children doing the Exercises in Practical Life, we can demonstrate quite clearly that the functions of attention respond to training. We can also observe over a period of time (which may be lengthy) the various responses to language described by Luria, from the primitive orienting response through the impulsive type of response to the selective, when the child simply obeys direction. Finally, we can observe the emergence of Luria's "preselective function" of language, where the child demonstrates appropriate responses to self-instruction; he may even be heard telling himself what to do. Thus, simple exercises such as washing hands or polishing shoes can be presented as an integral part of language training when they are *ordered to a definite end.*

The Montessori materials for "sense training" represent a selection from material used by Itard (1801) and Seguin (1864) in their attempts to educate deaf and mentally deficient children, from objects used as tests in experimental psychology, and from material designed by Montessori herself.

The sensorial materials are grouped according to sense: auditory, visual, tactile, taste, smell, and stereognostic. They are also subgrouped according to specific qualities, such as sound intensity, pitch, form, dimensions, color, texture, weight, taste, and odor. We shall describe only a few of these materials.

Each sense is trained in isolation. There is no order of presentation

TABLE 10.1 *Examples of the Exercises of Practical Life*

Exercises in Coordination	Care of Person and Environment	Exercises in Fastening and Unfastening
Pouring	Washing	Dressing and undressing
Rice	Hands	Buttoning
Water	Table	Hooks and eyes
Milk or drink	Dishes	Zipper
Carrying	Tidying and cleaning	Lacing
Chair	Putting	Tying
Table	furniture in order	Folding and unfolding
Tray with a vessel	Dusting	Handkerchief
Cutting	Sweeping	Towels
Cutting raw vegetables	Polishing	Clothes
Cutting cloth	Table	Hanging up clothing
Peeling fruit	Shoes	Paper from wrapping
	Silver	

according to a particular sense, but there is an order in the method of presentation. Contrasts are always presented to the child first, then identities are established through matching, and, finally, gradations of quality are presented for finer discrimination.

When we "train" the senses, we are not trying to make the child see better; we are helping him to know what he sees. By providing strongly contrasted sensations followed later by a variously graded series of sensations, we teach the child to discriminate. For example, if he learns first red and blue, then several shades of red and later several shades of blue, he is being taught what is red and what is blue. At the same time he is learning to compare and match, to contrast, to discriminate, to distinguish different sense impressions, and to put them in some sort of order. This is the beginning of a conscious awareness of the environment as opposed to any unconscious knowledge he already may have. As he isolates the sense impressions and the qualities perceived, the child gradually builds up abstract conceptions, first the general category of "color," then redness and blueness, darkness and lightness. Of course, the retarded child does not accomplish this quickly!

Isolation of a single quality in the material helps the child to focus his attention on the stimulus, and therefore in many sets of exercises the objects are identical among themselves in all respects except for gradation. For instance, the color tablets are all precisely the same size, weight, and shape, but they differ in the quantity of color. The child can concentrate on color alone. Since these children have difficulty in the organization of incoming stimuli, the sensory information is presented in an orderly way. By training one sense at a time and by isolating one quality, such as color or length or height, the mind can give attention to that particular quality and can learn to create mental order. The apparatus is designed to present the knowledge systematically, and therefore the order is apparent.

We might consider this type of training as aiding the child in the process of progressing from the first to the second signal system (Pavlov, 1941), where the verbal stimulus affecting the second signal system stands for a whole class of nonverbal stimuli with a certain property, or set of properties, in common.

The material for training the tactile sense includes touch boards: one wooden board divided into two equal rectangles, one being perfectly smooth polished wood, the other being covered with sandpaper; one board with alternating strips of sandpaper and bare wood; and another covered with strips of sandpaper graduated from very rough to almost smooth. There are fabrics of different kinds, always in pairs so that they can be matched as well as contrasted. Also, there might be baric tablets, paired tablets of wood that are graded in weight, and thermic bottles graded as to temperature.

Solid insets and blocks of wood containing holes for the insets are used for recognition of dimensions by visual and stereognostic means: in one series of cylinder blocks, the difference is in height only; in the second series, the difference is in diameter only; in another, there is a graduated difference in all three dimensions.

The Pink Tower is a series of ten cubes, the sides beginning at 10 mm and increasing by 10 mm for each so that the largest is 4 in. (100 mm). The child gradually learns to make a column that is correctly graded from the largest to the smallest cube.

The Long Stairs are ten rods, each 30 mm square but varying in length from 1 dm to 1 m by regular increments of 1 dm. These are to enable the child to discriminate lengths both visually and kinesthetically by carrying them between his two hands. Later these rods lead into learning numbers.

For teaching color there are tablets in eight colors, and for each color there are eight corresponding shades varying in intensity. Two sets are used so that the child can match each pair until he is ready to discriminate gradations of shades.

Wooden plane insets and wooden geometric shapes and solids are used for the tactile and kinesthetic exploration of form. There are also cards on which are printed the geometrical figures corresponding to the geometrical shapes so that the child can match them and interpret visually the graphic symbol for the solid object.

It should be noted that Montessori consistently provides material which allows for the activity of the child (motor mediation). The possibility of arousing the child's attention and maintaining it depends less on the quality belonging to a thing than on the opportunities which it offers to *do* something with it. These children often are not able to concentrate on *things,* but they will learn to develop a focus of attention that is sometimes remarkable in the *doing* of a specific activity.

Following a period of "sense training," after the child has had long practice in handling the materials and begins to show that he can identify differences or contrasts, the teacher begins to teach nomenclature. Here she uses the Three Period Lesson, originally used by Seguin, to obtain the association between an object or quality and the corresponding name. It is important to keep in mind that the child must *know* all about an object or quality, that he must have had ample living experience with it before he is presented the name. Hunt might call this sense training, the acquisition of the "experiential roots of a given schema."

The First Period consists of *associating* the sense perception with the name. The teacher presents, for instance, the longest and the shortest rod and says, "This is short. This is long." She repeats the statements many times, slowly and clearly. No other words are used in order to avoid confusing the child.

The Second Period tests the child's *recognition* of the object corresponding to the name. After the name is given for a suitable period of time the teacher asks, "Which is short? Which is long?" If the child points correctly, the rods are mixed, and the teacher repeats the questions, continuing to strengthen and fix the association until the child is ready for something else.

The Third Period is verification that the child can *recall* the name corresponding to the object. Now the teacher simply asks, "What is this?" The teacher may insist on correct articulation, and much repetition is usually required.

The Three Period Lesson may be slow and tedious, but it is effective. The period of time between success in the second and in the third periods (that is, between recognition and recall) is often quite lengthy even for children of normal intelligence and provides a striking illustration of the time and repetition required for a child to establish the associations so necessary in language development.

It should be recapitulated that it is by practicing the sensory exercises *first* that the child gains the mental experience and concept of a particular quality (Piaget's image primacy thesis); after this, the symbol is introduced. The exercises also involve motor mediation, without which, we have learned, training does not facilitate discrimination.

The same principle is used in the education of auditory discrimination. Developmentally, a child must first learn to distinguish between noise and sound as apart from silence. Since this training starts with strongly contrasting differences and passes on to almost imperceptible differences, part of "auditory training" for our nursery children includes training in silence. This has many advantages, some of which may be obvious.

The analysis of sounds relative to speech are essentially auditory-visual-tactile-kinesthetic exercises connected with the learning of the alphabet. Sandpaper letters are used which the child traces with his fingers as he voices the sound of the letter simultaneously, thus utilizing an integrated tactile-kinesthetic-visual-auditory approach. Later he will use the movable alphabet to build words. It consists of cardboard cut-out letters which the child can hold in his hand and manipulate himself. Touch is combined with movement.

The method of tactile and kinesthetic exploration of geometric forms and letters is presented precisely as Zaporozhets describes the eye and hand movements he observed in the perception and recognition of form: fixing the stimulus in space and then exploring around and within the contour (Pick, 1963). The children are required to trace the sandpaper letters with their fingers. First, however, they are prepared for this by previous experience with the touch boards and by the tracing of wooden plane geometric forms with their fingers. They have been learning to develop a conscious attentive process combined with reinforcement and the mediation of continuous feedback.

It is not possible to go through all the details of this training. However, we hope that this smattering demonstrates that many principles basic to Montessori's work are quite to the point today. Adelaide Colli-Grisoni, Professor of Child Neuro-Psychiatry at the University of Milan (1957), has said it well:

> Stress is laid upon [her principles] by even very recent research which . . . formulates problems that Maria Montessori had stated and widely discussed at a time when the assessments of Neuropsychology and Psycho-physiology, which now confirm them, did not yet exist!

Many present-day educators in special education are presenting methods derived from Montessori, Seguin, and even as far back as Comenius, often without realizing their source. Of all of these, Montessori formulated a system of coordinated training sequences which originally were used successfully with retarded children. It is our own experience that early sensory-motor training, starting at the level of preverbal experience, is of major importance in the establishment of a language program for these youngsters. Current research certainly points in this direction, and the research literature contains many useful directives for the teacher. Applications of these often overlooked or not understood basic approaches to child training would greatly enhance the effectiveness of the work with young retarded children.

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CHAPTER 11

THE SLOW LEARNER, GROUPING PATTERNS, AND CLASSROOM COMMUNICATION

Elizabeth Monroe Drews

INTRODUCTION

All research stems from a philosophical orientation or set of basic assumptions, sometimes implicit, sometimes explicit. It is my belief that as researchers we owe our readers the courtesy of searching our consciences and of making the effort to reveal our personal predilections and biases, even if such admissions may diminish popularity or easy acceptance. My own leaning is away from the deterministic stances. In fact, my orientation has been called optimistic and romantic; and, in many ways, it probably is. At least, I am interested in the large rather than the small scale goals and in holistic rather than atomistic thinking. For example, I feel that our objective in teaching children should be to encourage both independence of thought and concern for others. Such an aim may seem vague, but in a number of our research studies[1] we have attempted to spell out the concrete implications of such ideals as a focal point in discussions with teachers. In our present research, teachers read from an extensive bibliography entitled *For Competence and Compassion,* which includes books which help teachers understand what Bernard Schlanger has called the "altruistic environment." In such an environment the aim is to encourage the individual to behave autonomously and to simultaneously show concern for his fellow man.

However, it is my assumption that this desire for children to develop in maximum ways is quite general among thoughtful adults, including those who engage in psychological research. Most of us want to foster those qualities which make us more human. There is general agreement among social scientists that man is above all a creature of thought, at least potentially, and that if we rob him of his mind we rob him of his humanity.

All this does very well for objectives, but it does not provide the framework for their realization. An accelerating technology may be dehumanizing unless we take countermeasures. Without appropriate education, many, and particularly the slow learner, will find neither useful and meaningful work nor productive leisure. There is every evidence that a contributing style of life and pattern of work are essential for psychological health. Yet social change may make this increasingly more difficult. Our technology is not only changing the face of the earth but also, in the name of automation, changing the conditions of work.

There will be less work, and work will be of a different character. The production of goods for consumption will be increasingly handled by machines with fewer people required to maintain and operate them, and a greater proportion of work will be associated with human services, including many which would be difficult to envision today. Many individuals will have to learn to lead meaningful lives outside the context of tasks that were formally designated as work. Education will be needed to aid in establishing guidelines for new kinds of work, as well as for meaningful leisure. Students must be taught appreciation of nature and art and the pleasures of primary contact with all kinds of materials. They must learn to value service to others and to see this service as respectable and important work.

As we seek to understand how human beings can have futures that are worth anticipating and lives that are rewarding, we must ask some general questions about the role education is to play. How can we develop individuals who are well equipped to benefit from and to contribute to a changing society? In the light of the astoundingly rapid changes in our technology—and, still more importantly, the upheavals in our social structure—it becomes increasingly important that we seek to understand the human being and his potential for interacting meaningfully with this changing environment. We must learn more about learning itself and the development of intelligence and creativity.

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[1] Elizabeth Monroe Drews, "The Effect of Homogeneous and Heterogeneous Grouping on Superior, Average and Slow Students." Cooperative Research Project No. 608; and, "The Effectiveness of Special Training with Audio-Visuals in Changing Aspirations of Intellectually Superior Students." Title VII, NDEA Grant No. 7-32-0410-140.1.

In many ways it seems that students are getting brighter, that they read better, and that most of them have better vocabularies and are more voluble than they were a generation ago. This is all encouraging; however, at the same time social demands for education and training seem to be outstripping the developed capacities of much of our youth. In spite of their increased intellectual abilities, many students are finding it extremely difficult to master today's knowledge and technologies. As someone has pointed out, you have to be able to read to open a milk bottle nowadays. The point is well illustrated by the continually changing definition of an illiterate. During the First World War a person was illiterate if he signed his name with an X; by the Second World War he was illiterate if he could not read at a fourth-grade level. In a recent paper entitled "The Post-Industrial Society," the Columbia University sociologist, Daniel Bell (1963), stated that soon we may call anyone without a high school diploma a functional illiterate; and a still more dismal picture was painted by Norbert Weiner (Gabor, 1964) who commented recently that in the future there may be little or no work for people with an IQ below 110.

However, the view that this group is a mortgage from the past that can retard society does not take into account the great needs of our society. The existence of unemployment does not arise from a shortage of work to be done, but rather from the inability of social agencies to shape these tasks into the parameters of work. There is certainly an increasingly wide discrepancy between the level of training required for certain tasks and the level of training of our populace. For example, the Army now suggests a minimal IQ of 115 for inductees. But the shortages of help are in almost every human service area: household help, care for the young and the aged, counseling, teaching, nursing, and social work. Much of this work needs more emphatic rather than verbal talents, integrity and generosity rather than speed and mental alacrity. Other needed services have not yet been defined clearly but need only the innovative thinking of humanitarians and the rising demands of our society to do it. Furthermore, the need for workers in the sciences and engineering is also expanding at an exceedingly rapid rate. Thus, we have the modern paradox of widespread unemployment (a surplus of untrained labor) coexisting with a widespread shortage of labor (resulting from a scarcity of trained labor). Education's role in alleviating these problems created by the demands of a rapidly expanding technology must be obvious. There is a vastly large number of people who must be increasingly well educated and specially trained, both to fill the demands for scientists, technicians, and workers in human service areas and to avoid taking upon themselves the chronic problems of the unemployable.

Yet we would be making a great mistake if we were to assume that the only problems presented to education by our rapidly changing society could be solved by producing an army of technicians ready to fit smoothly into the machinery of modern technology. Men still must find meaning in life. Aesthetic perceptions and nonverbal learning must be cultivated, and each of us must learn more about human living. In the world of future positive psychological adjustment, meaningful human relations will become more and more important. The population explosion and increased mobility will cause people to live closer together, often with others of widely differing backgrounds. Thus the development of close human relationships will be more difficult by the frequent existence of large differences in background, outlook, and language. Not only will it be difficult to adjust to such unusual and complex human relationships, but there also will be other problems. The world that we are moving into—a world of machines, a world of exploding knowledge, a world of expanding cities—adds further complexity and uncertainty. The retarded may find such patterns overwhelming. They, like all of us, will have to deal with continual change and with complexities. This and the loss of old familiar ties will magnify feelings of inadequacy and aloneness if we do not intervene.

The release from the thralldom of work might produce Contented Cows and Fat Cats (with apologies to Dr. Rosenberg), but it may also result in unhappiness. Eric Hoffer (1963) has recently noted that a sense of self-worth for most individuals in our society is dependent upon the ability to work. Meaningful activity seems to be necessary for positive mental health. Luxury and satiety are not enough. There is a need for mental and physical involvement, for challenge and excitement. Individuals also need a positive sense of identity, an identity which is to a large extent formed on the basis of the individual's role in society. Many feel, as complexity increases and old ties are broken, that they do not belong. Alienation and anomie have become problems of our times. The retarded and the lower class individual, as indicated in Hollingshead and Redlick's *Social Class and Mental Illness* and Haring's *Attitudes Toward Exceptional Children,* often feel isolated and left out.

Our psychological goal must first be to satisfy certain basic needs and then to move from this point to the development of ego strength and identity. In our teaching we want to make the learning experience one which is aiding the development of identity rather than increasing the individual's sense of alienation.

This brings me to my frame of reference, that is, Maslow's (1954) hierarchy of needs. For most individuals it is necessary that the lower order needs for love, acceptance, and recognition be met before they can become growth motivated and begin to work independently on intellectual tasks. The slow need and want psychological acceptance and feel that having a responsive teacher is all important. In contrast the gifted are usually treated well by teachers and accept this as a matter of course. Consequently, they are more interested in having a teacher with knowledge and ability. The gifted students prefer to work on the complex and difficult; the slow are usually happy to be masters of the obvious.[2]

Perhaps all of this sounds "tender minded" in the William James sense. However, the very direction in which society is moving is, and must be, toward more humane concerns. Present emphasis on the education of the mentally retarded has come out of this kind of orientation. C. P. Snow, the British novelist, has said that at least there is a great concern for human kindness. Arnold Toynbee, the British historian, remarks that if we survive the twentieth century, this era may become known as the Age of Altruism.

A survey of current research reveals little that is specifically devoted to the development of the values consonant to this frame of reference. However, there is a growing recognition among social philosophers that it is important to do just this. For a number of years it has been my view that we must reexamine and reformulate our patterns for educating youth (especially those whose talent for symbolic learning is limited) in the light of certain broader human objectives. We must ask how these slow learners can come to value themselves and others; how they can develop a desire to learn; how they can become fully participant in the dialogue of the classroom. It is my view that such beliefs and attitudes and talents are essential for effective living in the out-of-school world.

In line with these views, for almost a decade we have engaged in research which has been looking at the effect of patterns of classroom grouping and teaching adaptations (in relation to differences in learning abilities) on the development of communication patterns and of attitudes toward self and school and learning.

RESULTS

The following discussion summarizes relevant information from a large-scale study of grouping in English classes at the ninth-grade level. The results of this study are examined in terms of their implications for questions which have been raised regarding the personal development of slow learners. In particular, we wish to learn how modified homogeneous sectioning combined with a good classroom climate, favorable teacher and peer attitudes, and appropriate instruction affect slow adolescent learners in the following areas: communication patterns, self-concept, and behavior and attitude toward learning. Thus we are focusing our research effort on the question of what changes occur in the student, given a designated curriculum and a particular kind of teacher and class setting.

Research on language development supplies information that is supportive of Maslow's hierarchy of needs. McCarthy (1954) stresses the importance of a warm, accepting environment, varied and complex experiences, and opportunities for communication. However, as Goldberg *et al.* (1962) have concluded in a recent review of grouping research, little effort has been directed toward evaluating the effects of grouping on ". . . such changes as work study habits, social adjustment, attitudes toward learning, self concepts, and other personal-social behavior." In other words, previous research provides little information as to precisely what effect a specially structured environment has upon the behaviors and attitudes of the slow learner.

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[2] Elizabeth Monroe Drews, "The Effect of Homogeneous and Heterogeneous Grouping on Superior, Average, and Slow Students." Cooperative Research Project No. 608. Part of the findings of this study relate to questions which were asked slow learners and superior students and which revealed these attitudes.

It was with a view toward reducing the abundance of ignorance in these important areas that the study reported here was initiated. The research involved almost 600 ninth graders: 118 slow learners, 325 average students, and 150 superior students. The slow group, with which we are particularly concerned, were three to eight years retarded in reading ability and language skills. All of them had group test intelligence scores below 90; however, when individual tests were administered, over half this group scored within the normal range. The experimental model, presented in Table 11.1, shows the distribution of these students in the various classrooms of the four schools. Placement in heterogeneous and homogeneous sections was made randomly from a pool of students whose abilities were roughly equivalent.

TABLE 11.1 *Experimental Model of Ninth-Grade English Classes*

	School							
	Otto		Pattengill		West		Walter French	
	Exp.[a]	Inexp.[b]	Exp.[a]	Inexp.[b]	Exp.[a]	Inexp.[b]	Exp.[a]	Inexp.[b]
Homogeneous superior 10–14[c]		X	X			X	X	
Homogeneous average 7–10[c]	X	X		X	X		X	X
Homogeneous slow 2–6[c]	X			X	X			X
Heterogeneous 2–14[c]	X	X	X	X	X	X	X	X

[a] Exp. = Experienced teachers, one.
[b] Inexp. = Inexperienced teachers.
[c] Reading and language grade levels.

The teachers were trained in English, and more than half of them had Master's degrees. Special in-service training sessions were held on a biweekly basis to allow this group an opportunity to engage in free discussion and form a philosophical orientation.

There is evidence that many teachers do not have discussions in their classrooms, although ostensibly English teachers have as a basic concern the use and interpretation of language. Typical class activities emphasize reading and writing skills and may include oral work; but this is often recitation, not the verbal interplay of free discussion. Our belief is that the latter form of oral communication is particularly desirable and that leading or participating skillfully in discussions is a talent which could be modified and improved. Traditionally, teachers spend more time talking than listening to their students. However, we concluded that this was not desirable (both Berrill (1955) and Bruner (1962) have written extensively on the need for involvement if learning is to be effective) and that students should be encouraged to formulate their own ideas and attempt to express them more often. We wanted to avoid such teacher statements as "I taught him, but he didn't learn."

Although the teachers had been trained in English rather than in psychology, during these in-service training sessions they showed considerable concern for the psychological health of the students. Discussion often centered on ways to improve the psychological climate of the classroom so as to maximize the emotional growth and well-being of the student. In addition, discussion often was concerned with the use of special methods and materials with slow learners. Many curriculum adaptations were made, and materials such as *Teenage Tales, Hot Rod Magazine,* and *Popular Mechanics* were used extensively.

We not only wished to insure that the teachers had an understanding of the psychological and intellectual needs of their students, we also wished to discover how this understanding would affect their interaction with students. Research designs, especially those formulated to test the effectiveness of grouping, rarely specify the content and method of teaching and seldom call for objective records of this process. To improve this situation, we not only discussed teaching approaches and materials in out-of-class meetings, but we also followed the teacher into the classroom with trained observers and tape recorders so that a record could be made of discussions.

We were also eager to have a comprehensive description of the students. Who were these slow learners? We knew that, although they read very poorly, they were faced with a curriculum where perhaps 85 percent of their activities required reading skills. We also knew that 70 percent of the slow group had fathers who fell into the unskilled categories on the Warner scale. (By way of contrast, on the same index 80 percent of the superior students were rated above this level.) We also discovered that, more often than not, slow students were middle-born children in contrast to superior students who were more frequently first and only children.

Relative to their other communication abilities, slow learners seemed to be best at talking. Their retardation was greatest in written composition and spelling skills. Their reading ability was somewhat better than their writing skill, but both reading and writing were well below their oral language development. Thus class discussion seemed to be a particularly appropriate mode by which the slow could learn and could experience successful and meaningful participation in school.

In view of the paucity of previous research in the area of classroom communication processes, the methods developed in our study were of necessity largely exploratory and informal in nature. Data were collected by teams of three observers who were graduate and honors students at Michigan State University and had spent the term prior to the experiment studying approaches. They visited each of the twenty-two classrooms three times toward the end of the experimental year, and at each of these three sessions, both teachers and students completed evaluation sheets on the discussion. The teachers rated the quality of participation of each student, and the students indicated how they felt about what was said. Observers kept a record of classroom climate and attempted to categorize classroom contributions. They also kept a record of order of student and teacher speech so that typescripts made from tape recordings (two of the three observed discussions were taped) could include the names of student contributors.

Detailed analysis of typescripts of all classes of one session yielded rather striking results The mean number of contributions per class made by 63 slow students in homogeneous classes was 4.03, as compared with 0.86 for 36 slow students in heterogeneous classes. (A contribution is defined as an uninterrupted verbal communication by a student or teacher.) Thus a major difference found between the responses of slow students in the homogeneous and those of an equally retarded group in heterogeneous classes was in the pattern of participation. In homogeneous classes, the usually silent slow student became a frequent discussant, and there was a far greater number of all class members who participated than there was in the heterogeneous classes where discussions were dominated by the intellectually superior students and a few voluble average students.

Oral participation in classroom discussion seems to be related to a kind of social reinforcement. At least this study revealed that students who talked were chosen by their peers as more competent than students who did not talk and that this was true whether the student was slow, average, or superior and whether the group was homogeneous or heterogeneous. However, a matter just as important as the fostering of social skills is the strengthening of learning. Oral interplay appears to accomplish this also. Putting an idea into one's own words and stating it clearly so that one's classmates can understand it demands much more involvement and a different kind of cognitive process from the usual classroom situation. Such involvement encourages a greater mastery of material, which is gained by the necessity of having to understand the subject well enough to put it into one's own words and by aiding the memory (both storage and retrieval of information) by each individual having to translate the material into his own idiom. Oral participation can be encouraged by structuring the setting and providing a facilitating climate.

This participation would seem to facilitate both useful learning and a more positive concept of self. Part of these benefits to the student may accrue as a result of the adaptability of the teacher and her ability to provide an appropriate communication model. In the study reported, teacher participation differed both in quantity and in level of difficulty for students of different ability levels and ability groupings. For example, the typical teacher in this study used easier words, shorter sentences, and participated more frequently and a greater proportion of the time when she was working with a homogeneous slow group than when she was working with a homogeneous superior group. An analysis of the percentage of words above the fourth-grade level used by the teacher in different classes showed that in slow homogeneous classes, teachers tended to modify their vocabularies toward the level of students, using only 7.6 percent of higher-level words as compared with 12.6 percent in the heterogeneous classes and 15.0 percent in the homogeneous superior classes. The flexibility in teacher leadership and communication patterns was not the direct result of any prior set of instructions given to teachers involved in the experiment but seemed to reflect a sensitivity to the needs of the particular students being taught. In the homogeneous classes, the teacher was able to respond to the particular needs of the group to a far greater extent than was possible in heterogeneous classes, where this could not be done without shortchanging some groups of students.

A further finding of particular relevance to the problem of the slow learner which emerged from our grouping study concerns the effect of grouping on peer attitudes toward the student. The differences with which the slow learner is viewed in the homogeneous and heterogeneous classroom is also apparent when we consider the teacher's ratings of him. Toward the end of the experimental year, teachers were asked to rate students relative to the entire ninth-grade population. The dimensions on which students were to be evaluated included: questioning attitude, open-mindedness, creativity, use of research evidence other than text, quantity of participation, quality of participation, and social acceptability. In addition, on three separate occasions during the second semester of the experimental year, teachers were requested to evaluate the student in terms of that day's performance. At the end of the year, students were asked to make sociometric choices in social and intellectual settings. With respect to slow students, differences between homogeneous and heterogeneous classes were striking. In heterogeneous classes, only 3.7 percent of the slow students received five or more nominations from their peers as being intellectually superior, compared with 71.8 percent of the slow students who were nominated in the homogeneous classes. In social nominations, only 33.3 percent of the slow students received five or more nominations in heterogeneous classes, as compared with 61.5 percent of the slow students in homogeneous classes. Admittedly the results are in part artificial, since in homogeneous slow classes only nominations of other slow students can be made. Nevertheless, the findings underline the fact that in a homogeneous class an experimentally imposed social structure may have a profound effect on the individual. In heterogeneous classes the slow student is rarely nominated by his peers as having special social or intellectual qualities. Partly because his peers disregard him, he begins to devaluate himself. In a homogeneous class the slow student and his peers are presented with a new reference group, and they find themselves evaluating and being evaluated by new standards, ones which more closely approximate their own abilities and potentialities. Also, more of the total group is brought into active discussion relationship and leadership roles, and thus more students develop a sense of involvement and a feeling of belonging.

In ratings of intellectual adequacy (on a five-point scale) made by teachers, the mean rating for slow students in homogeneous classes was 2.7 and in heterogeneous classes 1.7. In social ratings, slow students were rated at 2.9 in homogeneous as against 2.1 in heterogeneous classes. It should be kept in mind here that these ratings are made with respect to the total ninth-grade population, and yet slow students are consistently rated higher by their teachers in homogeneous classes than in heterogeneous classes. These results reflect a complex interaction of factors. The first and most obvious observation is that students are seen in relation to a new set of standards, and they therefore are more likely to be evaluated in terms of their own abilities in the homogeneous classes. But in addition, higher teacher ratings may reflect the more adequate performance of slow students. They read more, talk more, and in general perform in relatively superior ways in homogeneous classes.

Differences in evaluations of the slow student in homogeneous groups extend also to the student's evaluation of himself. Students were asked to compare their ability with that of their classmates. On a three-point scale, homogeneous slow students rated themselves as 2.24 (slightly above average) whereas heterogeneous slow students rated themselves at 1.71. This difference was significant at the 0.001 level. In addition, a concept-of-self-as-school-learner scale consisting of twenty items with a four-place response scale was administered with similar results: Homogeneous slow students rated themselves significantly higher than did heterogeneous slow students. The homogeneous slow students received a mean score of 10.9 in contrast to the heterogeneous slow students who received a score of 5.5. This difference was significant at the 0.05 level. Again, there are probably many factors which produced this difference. In the homogeneous class, increased peer acceptance, a more favorable and accepting attitude on the part of the teacher, and most probably an awareness on the part of the student himself of his increased productivity all contribute to a significant change in the student's self-concept.

I have tried to describe the four broad areas with which our investigation of grouping was concerned in terms of their particular relevance to the problem of the slow learner. Perhaps at this point it would be well to attempt a summary of the results in terms of the complex interrelatedness of these different aspects of the study. We noted first that communication patterns in the homogeneous classes differed from those in heterogeneous groupings. The teacher was able to direct her full attention on the slow learner and his particular needs and was able to exhibit some flexibility in her own speech patterns. We mentioned earlier that the slow learner evidences a strong need for acceptance from the teacher. He apparently should have his lower-order needs (for security, acceptance, and recognition) met before he can proceed to higher-order cognitive needs and more self-direction and risk taking. This hierarchical relationship of lower-order and higher-order needs is not always kept. Both kinds of needs can be met simultaneously, but it does seem to be generally true that the slow learner proceeds according to the hierarchical structure. In terms of communication, this means that before the slow student can feel free enough to express himself, he must feel safe in doing so; before he can talk, he must know that someone is listening. In the homogeneous classroom, the teacher is free to do just that, to provide the assurance he needs and, as he begins to express himself, to encourage him to assume some of the leadership in the discussion process. In addition, the teacher must be able to communicate with him on his own terms and his own language.

We have seen what happens when such a warm and accepting environment is provided for the slow learner. He becomes more open to himself and to the world; he participates much more in discussion and begins to formulate his own ideas or at least to phrase the ideas of others in his own terms; he reads more; he writes more; he becomes much more involved in the classroom learning process. In addition, the homogeneous structure of the class of which he is a member makes it easier to win peer group acceptance. He is one of a group of students who are similar to himself in background, interests, language, and capabilities—a group with which he can readily identify himself as an active and significant member and with which he can communicate with relative ease. As he gains increased group acceptance and teacher acceptance and as he finds himself beginning to contribute much more actively in the classroom communication process, his sense of self-worth and competence increases. This in turn frees him more and more to establish lines of communication between himself and the outside world of people and ideas; in short, he becomes free to learn. This is the pattern which emerges from the various aspects of the grouping study.

RESEARCH CONSIDERATIONS

In his book, Vygotsky (1962) states, "The primary function of speech is communication, social intercourse." This statement indicates that the study of speech should properly be conceptualized within a broad framework which includes all forms of social intercourse. The viewpoint expressed in this chapter implies that communication problems in the slow learner must be approached from the standpoint of broader problems in interpersonal relations. As to the question Why study communication in the classroom? I think a full and thoughtful answer can be given only when it is realized that the process of education is really nothing other than communication; in a very real sense everything we know which does not result from direct "blind" sensory experience to which we have not yet assigned any meaning results from communication. The classroom is in many respects an ideal place in which to study verbal interchange as it relates to thought process. It provides a natural setting for interpersonal exchange; that is, it is not artificial or contrived in the way that a laboratory may be, and yet it is amenable to certain kinds of control. Second, it lends itself readily to two different types of research. Research in the classroom may be directed at identifying and analyzing the nature of the communication process and communication problems (studying the situation as it is), or it may be directed at attempting to identify factors which will remedy the problems (intervening and providing for more adequate learning).

Many factors have been associated with the retarded development of language ability. In addition to congenital and other defects of the speech organs, impairment of speech and hearing may result from impairment of the functioning of the central nervous system as a result of brain damage (as in aphasia). Perhaps more common are the children who are isolated or neglected, culturally deprived, or who fail to develop language ability as a result of lack of opportunity. Whatever the cause of the deficit, there seems little doubt that the encouragement and facilitation of the use of language is an important educational endeavor.

The importance of attempting to remedy language problems as early as possible may be seen when we consider how closely related are language and thought. Whorf (Maccoby *et al.,* 1958) has pointed out how language shapes the very nature of our thoughts. This close relationship between language and thought is particularly evident in the schools, where learning ceases if for any one of a number of possible reasons communication channels are cut off. Further evidence lies in the fact that individuals learn best and most thoroughly that which they are able to express in their own words. Processing information in one's own terms increases ability to retrieve it later, and makes it easier to relate newly acquired knowledge to previous knowledge and experience so that it is assimilated in a form in which the individual is most likely to be able to make sense out of it, both in terms of his needs and in terms of his other knowledge. In this light it is easy to see how a communication problem actually does impair an individual's *ability* to learn, and not merely his ability to *express* what he has learned.

Communication, as we have stated, is intimately related to other areas of interpersonal relations. Communication behaviors can for this reason play a very prominent role in social acceptance. It is generally true that those with an ability to convey feelings and ideas through language are more socially accepted than those who cannot interact in these ways. Any human relationship can be improved by the proper use of speech as communication. The central role of speech in friendships is easily grasped if we try to imagine a close friendship in which the two parties could not talk with each other. It is for this reason that it has been said that the measure of a good marriage is the amount of conversation between the partners (Blood and Wolfe, 1960).

It is largely because of the many-faceted importance of speech that it can provide a wedge for breaking into the vicious cycle which is set up for the slow learner. Security and confidence can begin to replace the fear and anxiety which already is present in the slow learner; doors can be opened to further communication; and a solid positive groundwork for further development can be laid.

Further research could be aimed profitably at both a wider and a deeper understanding of problems involved in communication for the slow learner. There should be efforts to understand the interaction of many variables in the communication complex. We should not lose sight of the broad framework within which specific events and processes occur in our attempts to gain more specific information as to their nature.

Knowledge of communication patterns, especially as these reflect the developmental level of the learner in terms of cognitive and personality development, is much needed. Similarly, there is an urgent need to understand situational variables that may affect these patterns. For example, studies of desirable grouping practices and the influence of teaching methods and materials as well as of the teacher herself are needed. It is suggested that research on the slow-learning adolescent be conducted in the following areas.

1. The characteristics of communication patterns in relation to thought processes. This might be done by between-group comparisons (how and why are slow learners different, if at all, from average adolescents in these characteristics?) or by studying slow learners directly (what are the relative strengths and weaknesses in their communication patterns?).

2. The specific ways in which communication is related to personality variables. Particularly useful would be an understanding of the process of identity formation in the slow-learning adolescent. Also needed are insights as to the relationship between self-concept and satisfaction derived from schoolwork.
3. The optimum and the permissible ranges of achievement and ability differences in the classroom, both from the teacher's and the student's standpoint. Restated from the standpoint of communication, this would ask, at what point do differences become so great that communication channels are closed?
4. The nature of varying instructional materials and the role of the teacher. Do some materials and methods facilitate and others impede the development of the slow learner? Are there other ways of accelerating the development of language skills and concomitant emotional and cognitive development? Can strengths be emphasized in such a way that weaker areas are favorably affected as well?[3]
5. The total range of potentialities (including those in the nonverbal realm) of the slow learner for learning. What goals may we realistically set for ourselves in attempting to encourage his development as fully as possible?

In contemplating research in such broad areas, we must ask what methods are available to us which will help us formulate answers to some of these questions. First, it seems to me that, as in all exploratory research of this kind, a fundamental error to be avoided at all costs is that of entering into research with a preconceived theoretical orientation which determines too specifically the nature of the data collected (for example, type of classifications and categories used). Theory should be built on facts, not the other way around.

Second, in an area of research touching on so many specializations and disciplines, it is perhaps most advantageous to try to take into account as many relevant kinds of variables as possible, attempting to relate them in a flexible and interactive framework. Specialized knowledge from other fields is frequently quite useful in gaining understanding and may be incorporated into a larger scheme.

Finally, a research method which deserves more refinement and application is that of content or interactional analyses of communication processes. Such an approach would prove invaluable in learning more about the nature and meaning of different verbal statements in the classroom. Levels of thought process and of personality development, including value systems, as well as the student's efforts to listen and integrate might all be investigated. As verbal behaviors and their antecedents are identified, it would be possible to introduce new materials and new teaching approaches and study changes in communication patterns. Research on communication among slow learners would thus provide an ever-increasing fund of knowledge about a vitally important behavior as it responds to social and educational inventions designed to produce desirable change.

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[3] Maslow (1954) indicates that "The syndrome of self-esteem, for instance, has been shown to change as a whole. If we try to change Johnny's stammering and address ourselves specifically to this and this only, the chances are very great that we shall find either (1) that we have changed nothing at all, or else (2) that we have changed not Johnny's stammering alone, but rather Johnny's self-esteem in general, or even Johnny as a whole individual. External influences usually tend to change the whole human being, not just a bit or part of him" (p. 29).

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CHAPTER 12

SUMMARY: DISCUSSION AND RECOMMENDATIONS

Editor's note: Material contained in this chapter was in large part prepared by four committees whose members participated actively in discussions and planning of a final report which was presented at the conclusion of this Conference on Speech and Language of the Mentally Retarded. Each committee had an assigned chairman who edited and presented the report. The committees were designated as *Theory, Development, Treatment,* and *Measurement.* These designations serve as the subheadings for this chapter. Since the report on theory was presented in three parts, the integrity of these parts has also been retained and the work has been credited to the respective authors.

THEORY[1]

Initial discussions by the committee members were concerned with the question of what uniquely distinguishes research on the theory of mental retardation from other research activities in the area of mental retardation. Two answers evolved from the discussion. One answer was that research on the theory of mental retardation might mean research on the *etiology* of mental retardation. We dismissed this tack for obvious reasons.

A second answer was that research on theory could be reinterpreted to mean the *application* of a general theory or body of knowledge (for example, linguistics, behavior theory, and social psychological theory) to research in mental retardation. The supposition was that the planning, design, and analysis of research in almost any area of mental retardation might be improved by the application of knowledge from these other areas. The Committee pursued this interpretation of their task although it meant overlapping the functions of the other three committees.

The Theory Committee discussed research related to *treatment, development,* and *measurement,* which were also areas of concern to the other committees. Perhaps the only differences between the report of the Theory Committee and those of the other committees are the special biases and interests represented by members of the Theory Committee.

Before getting into the subject matter, one more comment should be made about the operation of the Committee. After the first meeting of the Committee, it appeared inconceivable that we could get unanimity on a single group report in so short a time. Instead, it was suggested that the group report consist of a collection of "minority reports," each of which would cover a person's own interests and special areas of competency. The Committee met several times and functioned as a critical audience for each of the minority reports. Three reports follow, the first by John Carroll on linguistics, the second by Jack Michael on behavior engineering, and the third by Seymour Rosenberg and Joseph Spradlin on social interaction.

Linguistics

(by John B. Carroll)

Introduction Any program of research on mental retardation—whether it involves simply the description, measurement, and diagnosis of this disorder or whether it involves treatment, therapy, and follow-up—needs to be based upon clear and well-defined systems for identifying the receptive and productive communication behaviors which are found in mental retardates or for trying to teach these behaviors to the retardates. A description of the communicative behavior of the retardate and of the responses we might desire to teach him can profitably be based upon a description of the language or dialect of the speech community.

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[1] Committee members: Joseph E. Spradlin, chairman; John B. Carroll; Jack L. Michael; Seymour Rosenberg.

Linguistic science is centrally concerned with the description and analysis of languages and dialects; and, even though educators and others have developed systems of language analysis, it is probably wisest to rely on the most scientific systems of description that are available. Convenient references describing linguistics and methods of linguistic analysis are those of Carroll (1953) and Gleason (1961). A useful reference on the linguistics of American English is the text by Francis (1958).

Language is ordinarily defined as "an arbitrary system of vocal symbols used by a speech community in social communication." This definition draws attention to the fact that language is a system or code that underlies its actual use in communication. We can use terms such as "speech" and "listening" to refer to the actual use of language in communication, that is, to the behavior of speakers and hearers which is patterned on a particular language system. This definition excludes gestures and a wide variety of noncommunicative acts from the strict definition of language; but there will be no objection to speaking of gesture language, pantomimic language, and so forth to refer to these paralinguistic communicative systems.

Linguistic science provides a model for analyzing speech and listening behavior because it not only identifies the linguistic entities that constitute the conventionalized stimuli and response underlying that behavior, but it also specifies this structural relationship.

Major theoretical problems for research Two classes of questions are posed, one dealing with language development and the second with the general learning abilities of mental retardates.

1. To what extent does the course of language development in mental retardation resemble that of normal children? Is it the case that the stages and sequences of development are the same except for a much slower rate of development in mental retardates? Does the resemblance reside only in the grosser phases of development (for example, the presence of babbling, the stage of early word acquisition, followed by the stage of syntactical development), or does it exhibit itself also in the detailed sequences of development as they might be found by an analysis of the order in which syntactical features are acquired?
2. For any given recognized clinical grouping of mental retardates, what are the parameters of learning and retention? In what way do these parameters differ from those obtained on "normal" populations? Of theoretical interest here, of course, is whether the limits of learning for mental retardates are fixed at markedly lower levels than for normals or whether the differences are primarily with respect to *rate* of learning. Also to be

investigated is whether slow learning results because of inadequate prior learning of basic repertoire of prerequisite skills, learning sets, and so forth.

Linguistics and mental retardation For the mental retardate, language learning seems to be in some way more difficult than for the normal person. To what extent is this a function of linguistic structure? For example, would a more regular language structure (Esperanto) be easier? Or in the case of learning to read, does the complexity of English orthography present more difficulties than would a simpler system like Augmented Roman (Pitman)? Although it would probably not be practical to teach Esperanto, the teaching of Augmented Roman or some other simplified spelling system might be explored.

In order to expedite the teaching of language, some techniques of foreign language teaching as developed by linguists might be utilized. Among the procedures which might be relevant here would be (1) teaching simple kernel sentence types before transformations of them and (2) controlling the order in which transformations are applied (for example, teaching yes-no question types before *wh*-questions, teaching positive sentences before negative sentences, and teaching active voice sentences before passives).

A second set of procedures from foreign language teaching is the following. Much substitution drill should be given so that form-class habits will be strengthened. For example, the teaching of a simple kernel sentence such as noun and intransitive verb should be arranged so that the child learns to replace the noun with other nouns, as in "Johnny walks," "the man walks," and "the dog walks." Another example is the placement of the verb with other verbs, as in "Johnny talks," "Johnny walks," and "Johnny eats." Actually, the choice of this example may be bad, since a preferable structure would be the present progressive: "Johnny is walking" and "the man is talking." The simple present is best presented with the adverbial modifier, as in "every day" and "every morning," so that we have: "Johnny walks every day" and "the man walks every day."

A third set of procedures used in teaching foreign languages which can be applied to the case of retarded language is to maintain the referential functions of language as strongly as possible by insisting that new language elements be generally learned under appropriate stimulus controls. That is, new words, new morphological variants, new syntactical patterns, and so on must be introduced in such a way that their referents (the concrete objects, perceived relationships, and situational conditions) are introduced in appropriate contingent relationships. For this purpose, much use must be made of pictures, props, and pantomime in language teaching. This does not preclude, however, drill on sentences and other structures without immediate referential control for the learning of intraverbal associations that are only indirectly related to referential situations. For example, a phrase such as "big bad wolf" might be learned first as a series of associated words before the referential functions of those words are learned. It should be noted that further psycholinguistic analysis may be required in order to specify the appropriate stimulus controls for various syntactical patterns. What, for example, is the proper behavioral setting for declarative sentences? Do they occur chiefly in response to questions?

Linguistic and conceptual requirements of the mental retardate In developing language training procedures for mental retardates, there is a need for information concerning the linguistic and conceptual requirements of the situations in which the mental retardate is to operate. This presupposes two kinds of analyses. One is specification and classification of life situations in which the mental retardate is to operate such as the school, the place of work, and the social environment. The second is the analysis of linguistic and conceptual requirements of the above situations. That is, what is the minimal vocabulary for each situation? Will gestural communication be sufficient? How well will it be understood by the normal person who is interacting with the retardate?

Some explanation of what we mean by "conceptual requirements" may be in order. It is possible to give an account of language behavior which regards linguistic entities (words, morphological changes, and syntactical patterns) as representing *concepts* in the sense that each entity is a response to a class of stimulus situations with definable attributes. For example, *water* (as a linguistic form) is a concept that refers to many possible situations where water is present. A more subtle concept is represented by the conjunction *if*. *If*, as a matter of fact, is a translation into linguistic terms of certain behavioral paradigms that can be treated psychologically under the rubric of conditioning. For example, the sentence "If he comes, call me" programs into the listener a contingency of calling behavior dependent upon a certain event (his coming). It would be of interest to study how rapidly a mental retardate can learn the proper use of *if* either as a listener or as a speaker. This sort of investigation could be extended to a wide range of concepts.

Behavior Engineering
(by Jack L. Michael)

In industry, a distinction is sometimes made between basic research and developmental research. Basic research is an attempt to find generalizable facts and principles, to evaluate hypotheses of theoretical significance, to answer abstract questions, and so on. Developmental research is often little more than an euphemism for trying to use existing knowledge to develop a product that has certain specified features. It is this latter kind of activity which seems most important at the present time.

The last twenty years of behavioral research have resulted in the discovery of a number of techniques for the control of behavior. These techniques and the principles underlying them are stated in terms of manipulable independent variables and observable dependent variables, which makes it possible for anyone who can read to apply this knowledge. Although there have been many successes in changing some behavior in some retarded individuals, there has as yet been no intensive and systematic exploitation of this technology for the remediation of retarded behavior in all of its aspects. It may be that the answers to most of the researchable questions which can be posed at the present time will be of little interest when we see that we can produce dramatic changes in behavior by more effective training. For example, comparison of the behavior of retardates with that of normals, say with respect to syntax complexity or modes of dyadic interaction, seems almost beside the point when we can produce various kinds of syntactic or interpersonal behavior by training. What such studies show is the result of the interaction of an unknown and chaotic environmental history with an uninterpretable or often nonexistent organic disability. And to make them even less relevant, the results are usually presented in terms of group averages or other statistical concepts whose application to the individual organism is quite unclear.

The kind of research which seems most relevant to our present situation is illustrated by the work of Dr. Sylvia Richardson on the application of the Montessori method to the training of young retardates and by some of the work of Richard Schiefelbusch, Ross Copeland, Joseph Spradlin, and others at Parsons State Hospital in altering the verbal behavior of the retardate. If, as may well turn out to be the case, intensive training of the Montessori kind renders to retardates the facility to use language in a considerably more effective way than ordinary training does, who is going to be much interested in the characteristics of those retardates who do not receive such training?

On the other hand, many people have worked for a long time in the field of retardation, and most express a relatively pessimistic view about such changes in behavior. The stability of the condition of mental retardation is often cited as evidence for an underlying deficiency in the ability to learn. How can the optimism implied above be maintained in the face of such a recalcitrant subject matter? Perhaps the answer is an unflattering one in terms of the learning ability of the optimists, but there is also another possible answer.

There is a common tendency to overestimate the extent to which human learning is related to the ordinary deliberate instructional activities of other human beings. A very large proportion of a child's repertory is developed as a result of the inadvertent consequences of his behavior on the physical and social environment and of the effects of these consequences on his behavior. This means that most human teaching activities represent only the final step in the development of a complex repertory. For example, when a parent teaches a child to tie his shoe, he is working with an organism that already has learned a large class of behavior regarding verbal instruction and imitation, as well as one that has learned to be reinforced by subtle social activities on the part of the adult. This can be appreciated if a successful parent or even a professional teacher of children is asked to develop a fairly simple repertory in an organism that does not already possess most of what is to be learned.

The technology of human learning has been greatly handicapped by the fact that the subject already knows most of what he has to learn and will often learn it no matter what the trainer does. The inadequacy of our description of the human learning process is masked by the virtual irrelevance of this description for most practical purposes. But in mental retardation—for example, in the development of language function—this inadequacy of technique is quite apparent. Present the successful parent or teacher with a child who does not possess all the ordinary skills that precede learning to talk. Require him, in other words, to build a repertoire from the beginning. About all that results is a relatively feeble intensification of those activities which are successful with ordinary children, namely, repetition, sometimes a relatively crude use of reward, frequent general disapproval, and little else. In such a colossal failure situation, it is very comforting to attribute the difficulty to the subject.

The stability of retardation with respect to a technology of behavioral change based on experience with normal human beings is not surprising. But we now have a much more relevant set of concepts and techniques: those which were applied in a very deliberate way to the development and maintenance of behavior in the chimpanzee, Enos, during his two orbits around the earth in a Mercury capsule. This was a repertoire which takes several pages of technical terminology to describe. The concluding statement of the investigators was as follows: "The ease with which new behavior may be added to the repertoire of the chimpanzee suggests that its behavioral capacities in both breadth and complexity have not yet been approached." Those of us who are beginning to make such applications to the mentally retarded human being would conclude similarly.

Social Interaction

(by Seymour Rosenberg and Joseph E. Spradlin)

The social psychologist is a relative newcomer to the area of retardation. Nevertheless, he can make an important contribution to the understanding, treatment, and measurement of retardation. As stated in other parts of this chapter, the retarded child is almost constantly in contact with other people whether he is in a well-planned language training program or in his natural environment. In the development and evaluation of a language training program, for example, we must consider not only the acquisition of certain responses but also the use of these responses in dynamic interaction with others. In this discussion we are concerned with the analysis of the social environment of the retarded child and the effects of this environment on his behavior.

Many of the research proposals summarized in this discussion are already an integral part of the research activities at Parsons, Kansas. A number of research studies of social interaction involving retarded children have been completed at Parsons and are now available in the literature. These studies which are cited contain detailed statements of the rationale, methodology, and findings of this type of social psychological study. Only the salient features of this type of research are summarized here.

Basic questions What is the social environment of the retarded child, that is, how do peers and adults react to the behavioral deficiencies of the child? How does the social environment of the retarded child affect his learning? It is obvious that language skills and indeed many other skills are acquired by a child in his interactions with other children and with adults. The details of these interactions are not well known. On the other hand, considerable data have been obtained on the behavior development of the normal child, that is, the age at which language and other skills appear and the sequence in which these skills appear. What occurs, however, when a discrepancy between chronological age and behavior development begins to appear? How do parents, other adults, siblings, peers, and so on react to this discrepancy? How do these reactions of others affect this discrepancy?

In order to answer these questions, developmental studies of language must be supplemented with research concerned with the interaction of the child with other people. For example, a number of laboratory studies have been made of dyads composed of two retarded children of known linguistic skills and of dyads composed of a retarded child and an adult (Rosenberg *et al.*, 1962; Siegel, 1963; Spradlin and Rosenberg, 1964). These dyadic studies, which are only beginnings, have focused on the questions posed earlier, namely, the effect of the retarded person on the behavior of the other person (adult or peer) and, in turn, the effects of these reactions on the behavior of the retardate.

These initial studies on assembly are also being supplemented with a series of additional studies on situational or task variables. A variety of experimental situations can be constructed especially for the retardate in which the language required of the participants in order to obtain rewards can be systematically studied by varying the structure of the task.

A particularly interesting example of such a study is now in progress at Parsons. The experimental situation was adapted from a task first used by Mason and Hollis (1962) at the Wisconsin Primate Laboratory. A detailed description of this work at Parsons is given here to lend concreteness to what is meant by a task variable. The Parsons work is not yet available in the published literature.

The apparatus is shown in Figure 12.1. It allows for the separation of the experimenter and the two children. The children are seated directly across from each other. The experimenter is shielded from the children by plywood panels. There is a translucent and an opaque shield which can be raised and lowered independently on each child's side of the apparatus. There is a one-way mirror which can be raised and lowered on the experimenter's side of the apparatus. The opaque shields allow the experimenter to place rewards in the trays in the midsection of the apparatus without being seen by the children. The translucent screens allow the child to see the trays in the midsection of the apparatus without being able to reach them. In order for the experimenter to see the children without being seen by them, the room is darkened, and the midsection of the apparatus is lighted by a 20 w fluorescent light mounted directly above the carts.

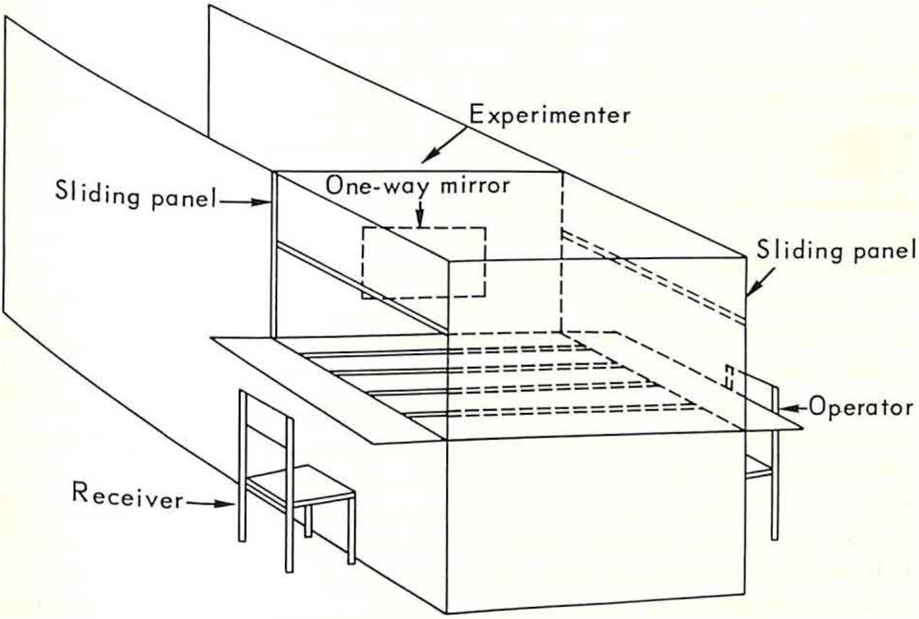

FIGURE 12.1 *A sketch of the two-person communication apparatus.*

In the midsection of the equipment there are four pairs of blocks attached to metal expanders so that the movement of one cart simultaneously extends the other cart in the opposite direction. In the communication task, shields and handles are placed on the trays so that one child (the speaker) is able to see which of the four trays is baited with candy (or other reinforcement), but he cannot reach the trays. The other child (the operator) can pull one of the four handles so that he can deliver reinforcement both to himself and to the speaker, but he cannot see the trays. The speaker can communicate the location of the candy, that is, the handle which the operator must pull to deliver reinforcement to both children.

Studies conducted in this way indicate that speakers of low linguistic ability result in fewer correct responses by the operator than do speakers of high linguistic ability. The language level of the operator did not affect the number of correct responses. Moreover, when a normal adult functions as a speaker providing gestural cues, even profoundly retarded operators learn to respond correctly on above 90 percent of the trials (Hollis, 1964). The ability of the low-level retarded operator to comprehend either high-level retarded or normal adult speakers, even when the retardate himself cannot function as an effective speaker, is consistent with the findings concerning normal children given in Chapter 4.

Applied questions The focus on social variables and their relationships to learning by a retarded individual leads in turn to questions concerning the applications of these findings or these methods to an alteration of the natural environment of the retarded. In the case of the institutionalized child, a number of possibilities suggest themselves, and these possibilities can be put into researchable questions. For example, what beneficial effects might accrue from judicious assignment of individuals to cottages or rooms? What instructions and training can be given to aides concerning the contingencies they should establish between the child's behavior and their own (Ezell, 1960)? Is it useful to introduce a token system in which the delivery of tokens depends on the operation of some apparatus or game by two or more children, that is, a cooperative task requiring certain kinds of behavior by the participants in order for tokens to be obtained? Here the two-person cooperative task used by Allyon and Haughton (1962) with schizophrenic patients might be adapted to retarded children.

SPEECH DEVELOPMENT[2]

In this volume at least two chapters dealt specifically with speech development of mentally retarded children. Chapter 6 by Richard Schiefelbusch included the statement, "In studying language development, we usually find it necessary to indicate successive stages of early functioning." In directing us to these various stages, Schiefelbusch emphasized the role of the social interactions between the child and his environment and suggested that we construct a language acquisition scheme on the basis of these interactions. He named the first stage of language acquisition Sensory Stimulation and Smiling and characterized it with the statement, "It is apparent, then, that long before the infant begins to use speech or to respond actively to the speech material of adults around him, he is engaging in a kind of visual, social responsiveness which is stimulating to the child and may be an important feature of his speech and language development." Thus, the beginnings of speech are traced to the first weeks of life when the child initiates smiling responses. In the three subsequent stages proposed by Schiefelbusch, level of language acquisition is always considered within a social setting, rather than in terms of the child's behavior alone.

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[2] Committee members: Gerald M. Siegel, chairman; Sylvia O. Richardson; Richard L. Schiefelbusch.

Sylvia Richardson in Chapter 10 also spoke of the problem of speech development and also emphasized the significance for the child's speech development of various prelinguistic experiences. According to Richardson, it is important that these early experiences confront the child with an environment that is rich in sensory stimulations and provide him with opportunities to experience and modify that environment through motor manipulation of the objects within it. Richardson, a pediatrician, thinks of these early experiences as fostering "the development of those semi-autonomous central processes that can serve as imagery representatives of objects and events and which can become the referents for the spoken symbols." Though Richardson describes her approach to language learning in a vocabulary that is largely medical and neurophysiological, the program she describes may be viewed as a highly systematized program of learning experiences. The steps in this program are designed to instill in the child sequences of motor and sensory skills of increasing complexity. These, according to Richardson, are the prerequisite or antecedent conditions that are necessary for the development of speech adequacy.

Although they focused on different facets of the child's early life, both Schiefelbusch and Richardson broke with traditional ways of viewing development by emphasizing behavior and experience rather than chronological age. Traditional developmental approaches to language have traced various language functions along an ascending chronological scale. One of the correlates (or perhaps outgrowths) of the CA approach to speech development has been the tendency to regard the age at which various skills *typically* emerge as the age at which they *should* occur. This, in part, is exemplified by the wide adherence given to the concept of readiness in speech development. The term "readiness" is generally used to connote the physical maturation of the child; it is seldom defined, however, in terms of measurable dimensions of maturation. As a consequence, there is the danger of reasoning circularly that since the average child begins using words somewhere around his first birthday, it is at this time that he has matured to the point of speech readiness.

If developmental data derived from studies of normal children are to have any relevance for the retarded child, we must know more about readiness than about the chronological (or mental) age at which various skills are typically mastered. There is little doubt that certain skills and levels of maturity are prerequisite to the performance of speech. The task of the developmentalist would appear to be to identify these prerequisites and, subsequently, to devise methods for enhancing or instating these skills.

It has been the feeling of this committee, therefore, that a meaningful approach to speech development is in terms of antecedent experiences and behavior sequences. Furthermore though such sequences necessarily occur over time, it would appear more profitable to anchor developmental descriptions to prerequisite skills than to a time sequence. It is not sufficient to know that between three and four years of age the normal child increases the length of his utterances and the accuracy of his articulations. We must discover, as well, the chain of events occurring within that interval that bears upon the advancement of these skills. There is nothing we can do to modify the CA of a child other than to wait. We can, however, structure the child's environment, give him practice in specific skills, take him through sequences of increasingly complex tasks, and place him in a variety of interpersonal settings.

In recent years, there have been increasing efforts to implement developmental norms in speech pathology, spurred in part by the work of Templin (1957) and Templin and Darley (1960). The contributions of Templin and Darley have been particularly notable because they have introduced some order and standardization into the process of articulation testing. Among the data reported by Templin (1957), and earlier data by Poole (1934), are age norms for the mastery of the various speech sounds. Some speech correctionists have interpreted this developmental continuum of speech sound mastery as an index of complexity or difficulty; it is assumed that those sounds which are mastered first will be the easiest for the child with an articulation problem to learn. These norms do provide some direction to the planning of speech correction. It may be, however, that the developmental sequence for normal children is a poor model for the articulatory defective child. It would be useful, therefore, to augment these norms with behavioral indices of ease of correction, rather than with a simple chronology of development. In some measure, this is what Milisen (1954) has proposed in his test of stimulatibility [which test is also included in the Templin-Darley (1960) procedures].

Within the Development Committee, attention was also given to the possible significance of critical or sensitive periods for the development of speech. There seem to be points in the child's development when he is particularly responsive to interventions from his environment. Disruptions of the home, serious illness, and emotional disturbances appear to be much more debilitating to speech development at certain instances than at others. Parallels can also be found in the development of such skills as walking. If these periods of differential sensitivity do play some role in language acquisition, it is important to determine whether they are a function of the child's prior experience, of physiological processes that are perhaps unavailable to the experimenter, or of some combination of factors. Rheingold (1956) provided a group of six-month-old institutionalized orphans with an unusual amount of social contact ("mothering") with a female experimenter for an eight-week period. At the end of that period, when compared to a control group, the "mothered" children were more vocal and socially responsive than their controls. One year later, however, the groups differed only with respect to vocal output. In interpreting these data, Horowitz (1963) has suggested that the experiment may have been conducted at a time in the lives of these children that was critical to the development of speech but not to the development of the other social variables observed.

It should be apparent that the notion of "critical" or "sensitive" periods is a variant of the readiness concept. Research related to this topic is clearly indicated. It is here, in particular, that many of the notions advanced by Schiefelbusch and Richardson might be tested. It would be significant to determine, for example, whether the vocal conditioning of three-month-old children described by Rheingold and her colleagues (1959) and by Weisberg (1963) would be influenced by providing the children with prior social or sensorimotor experiences.

In addition to such research, there is also a need for measures with which to describe and predict the developmental sequences discussed by Schiefelbusch and Richardson. Schiefelbusch suggested that it is important to trace the social interaction of the infant with persons in his environment through the various so-called stages of development, critical and otherwise, to the point of full-scale language acquisition. Richardson stressed the necessity for similar information relating the child's speech development to patterns of motor and sensory stimulation and growth. In a significant way, of course, these two areas of study necessarily converge. For the most part, the young child receives sensory and motor stimulation through the mediation of an adult and in a social situation. An additional avenue for research would be an exploration of the interplay between specific forms of social and sensorimotor stimulation. It may be, for example, that a designated sequence of motor acts can be taught more effectively in one social complex (for example, in the presence of peers) than in some other (in the presence of adults).

One final word concerning the relationship of speech development to remediation should be added. When, as a committee, we attempted to explore the boundaries of our responsibility, we soon found ourselves dealing with the matter of speech remediation for the retarded child. Although we attempted to discipline our conversations, it was apparent to us that eventually the concerns for speech development and speech learning in the retarded child must merge. It was our feeling that, as we inquire into the process of speech development, our special concern is to specify those prerequisite skills that are fundamental to the progression of speech growth and, more important, that are amenable to environmental manipulation. It is here that the areas of speech development and speech remediation coalesce.

TREATMENT[3]

Among the more readily observable physical and behavioral problems presented by the mentally retarded are those of communication disabilities. Difficulties arise in relating mental retardation and communication problems because of the variability of biological, psychological, physical, and sociological dimensions of the mentally retarded who are trying to communicate.

Thus, it becomes apparent that it is impossible to focus only on the defect and inadequacy of the retardate. Rather, we come to feel that the organism fails in the environment, and the environment in turn fails the organism. The retarded and his environment are not mutually self-adjustive. We are concerned with the total personality and intellectual growth of the child, one aspect of which is communicative behavior. Therefore action must be taken in terms of planned and appropriate intervention designed to improve and facilitate the consequences of the communicative act.

The search for appropriate treatment procedures would necessarily include research in: (*a*) the broad dynamics of oral communication behavior; (*b*) the development of simplified linguistic systems; (*c*) the effects of the physical and the psychological environments on the communicative process; (*d*) the instructional and learning processes involved in the acquisition of communicative effectiveness; (*e*) the interpersonal dimensions of human behavior; and (*f*) the intrapersonal dimensions of the individual.

The following are representative, but not all-inclusive, suggestions which appear to be promising and profitable areas of investigation, the results from which would contribute to the formulation of scientifically planned treatment programs. Investigations should be conducted to determine whether there are oral behavior patterns in infancy which are early indicators of previously unrecognized mental retardation. If early indicators in the oral behavior can be validated, research should be initiated to establish whether mediation of sensory enrichment can be made during infancy which will improve the probability of later language acquisition.

Treatment programs should include investigations of the systems (patterns) of sensory input for retarded children which will facilitate or improve language acquisition or information retrieval. Further investigation is required in the area of visual, auditory, and tactile discrimination ability of the retarded as these skills relate to language acquisition and communicative effectiveness.

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[3] Committee members: Mack D. Steer, Chairman; Ross H. Copeland; Elizabeth M. Drews; Bernard B. Schlanger.

Therapy procedures based upon deprivation and supplementation of selected sensory channels should be investigated. Explorations should be attempted to discover whether developmental data reveal the retarded child's readiness and need for a structured language training program. Manipulated response latency of mentally retarded children to psychophysical stimuli should be investigated.

Therapy techniques based upon aural rehabilitation methods—that is, lip reading and manual communication—should be investigated.

Standards should be established concerning minimal physical facility requirements for the maximal effectiveness of communication training programs.

Treatment techniques based upon closed-circuit TV instruction should be utilized and evaluated.

Research is needed to extend and refine the application of teaching machines, not merely to traditional academic content areas but also to the communicative processes.

Instructional procedures based upon the automatic control of communication output should be evaluated.

The possible value of electronically mediated auditory feedback as a part of a therapeutic procedure should be exhaustively analyzed.

The affects and effects of individual versus group training should be determined. Attention should be given to the importance of homogeneous versus heterogeneous pupil assemblies.

Research is needed to establish critical criteria to ensure that pupil selection is consonant with the goals of specific training programs in different settings.

Investigations should be initiated which will determine the effectiveness and impact of clinician-supervised programs of treatment administered through a team of adjunctive or auxiliary specialists.

Equally important, the value of including parents in structured treatment programs should be investigated.

Programs of investigations should be developed to detect and evaluate the pupil-therapist interaction, the therapist-treatment interaction, the pupil-pupil interaction, and the therapist-pupil-treatment interaction.

Treatment programs should be designed to account for and incorporate those interactions which will yield maximum treatment effectiveness.

The psychosocial attributes of the clinicians selected for treatment programs should be studied, and the programs of clinician training should incorporate such considerations.

Therapy techniques utilizing normal children in the role of instructors for mentally retarded children should be investigated.

Therapy procedures involving the assignment of the retarded child to the role of a teacher should be investigated. These studies should seek to evaluate the impact of this "teacher" role on the improved communicative attitude and output of the retarded "instructor." These studies should include other retarded children, other living specie, and inanimate objects as the experimentally designated recipients of the instructional efforts.

In summary, experimental treatment programs based upon the most recently established research findings should be developed and evaluated for use with mentally retarded children.

MEASUREMENT[4]

Measurement assumes that behavior can be quantified and analyzed qualitatively. Numerous other assumptions are inherent in the process. Among these are the ideas that we are, in fact, using an instrument or technique which relates to the ability of concern and that this instrument consistently performs the same function. The many other problems related to quantitative and qualitative assessment are magnified when we turn our interest to the exceptional child. Here test adaptations, often unstandardized or with inappropriate normative data, serve as the only measurement devices. The questionable appropriateness and unavailability of many tests, coupled with general paucity across all areas of exceptionality, have been long-standing problems in special education.

Discussions of measurement related specifically to the area of speech and hearing of the mentally retarded do not produce markedly different conclusions. They only serve to call attention to a general need for advance and refinement of measurement tools in the entire field of speech and language.

Here we discuss only the measurement of linguistic-psycholinguistic abilities and the speech act, that is, input-output. It is realized that this places restrictions upon the assessment of speech and language. Further research must also involve sociometric, psychometric, medical, motoric, and learning measures to allow greater advances in our informational store concerning mental retardation.

This committee recommends that attention be turned to measurement for three purposes: (*a*) diagnosis, (*b*) prediction, and (*c*) change in development. In differential diagnosis, instruments are needed which give information on speech and language deviations from the norm, as well as deviations within the group. Predictive measures indicate the feasibility of treatment programs, and those related to change allow assessment of treatment over time. At present, there seems to be no overall picture of the measures that have been developed for these purposes. This committee suggests that a systematic attempt be undertaken to discover all such tools reported in research literature, with particular attention to research grant reports.

Linguistics and psycholinguistics have provided models for the development of further language measures with the mentally retarded. Just as articulation tests have been derived from the phoneme, more attention must be paid to the word forms as a base (morphemes) and to the relationship of words in an utterance (syntax). Little is known about the "hard core" of unambiguous words necessary to serve the communication needs of the retardate in the majority of his social and vocational situations. Therefore, his speech and language progress toward this vague goal is hardly measurable. Further analyses of taped protocols of the speech of the mentally retarded seems advisable. Again the close relationship of theory, development, treatment, and measurement is most apparent. The further development of existing experimental psycholinguistic measures [such as the Illinois Test of Psycholinguistic Abilities (ITPA) and Parsons Language Sample (PLS)] is encouraged. Here again, a need is recognized for instruments which are prepared to sample on a prelinguistic level up through the optimal performance that might be expected of the mentally retarded.

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[4] Committee members: James O. Smith, Chairman; Margaret C. Byrne; William Carriker; Joseph E. Spradlin; Joseph M. Wepman.

Specifically on speech input, this committee feels that hearing testing procedures generally used with the retarded are not adequate. There is a need for further investigation of audiometric techniques which distinguish hearing loss from intellectual deficit. This committee also recommends the development of more precise measures of auditory discrimination, auditory retention, and the relationship between these aspects and the learning process.

Further analyses of the retarded child's speech output will require refined and simplified articulatory measures. Pictorial stimuli will need to be studied in order to reduce the large number of no response or inappropriate response situations. Also, measures of the motor movements in speech would seem to be useful for the planning of specific therapeutical programs. These measures will have to be based upon tasks that are meaningful to the child of retarded mental development.

In summary, it is felt that current measures of speech and language development need to be explored further through research. Additional measures are needed but should be developed from theorized positions and in keeping with treatment programs. At present, diagnostic specificity is lacking and poorly communicated. The validity of predictive measures is rarely known. Measures of change in subjects over time as a result of treatment are few in number and seldom sensitive to the within units of gross increment.

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